

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE Dec 1994		3. REPORT TYPE AND DATES COVERED																					
4. TITLE AND SUBTITLE A Design-Build Process map for Air Force Military Construction Projects				5. FUNDING NUMBERS																					
6. AUTHOR(S) Andrew Allen Thorburn				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/CI/CIA 94-139																					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AFIT Students Attending: University of Texas at Austin				10. SPONSORING/MONITORING AGENCY REPORT NUMBER																					
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) DEPTMENT OF THE AIR FORCE AFIT/CI 2950 P STREET WRIGHT-PATTERSON AFB OH 45433-7765				11. SUPPLEMENTARY NOTES																					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for Public Release IAW 190-1 Distribution Unlimited MICHAEL M. BRICKER, SMSgt, USAF Chief Administration				12b. DISTRIBUTION CODE																					
13. ABSTRACT (Maximum 200 words)				<table border="1"> <tr> <td colspan="2">Accession For</td> </tr> <tr> <td>NTIS CRA&amp;I</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>DTIC TAB</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Unannounced</td> <td><input type="checkbox"/></td> </tr> <tr> <td colspan="2">Justification</td> </tr> <tr> <td colspan="2">By</td> </tr> <tr> <td colspan="2">Distribution /</td> </tr> <tr> <td colspan="2">Availability Codes</td> </tr> <tr> <td>Dist</td> <td>Avail and/or Special</td> </tr> <tr> <td colspan="2">A-1</td> </tr> </table>		Accession For		NTIS CRA&I	<input checked="" type="checkbox"/>	DTIC TAB	<input type="checkbox"/>	Unannounced	<input type="checkbox"/>	Justification		By		Distribution /		Availability Codes		Dist	Avail and/or Special	A-1	
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				16. PRICE CODE																					
17. SECURITY CLASSIFICATION OF REPORT		18. SECURITY CLASSIFICATION OF THIS PAGE		19. SECURITY CLASSIFICATION OF ABSTRACT																					
				20. LIMITATION OF ABSTRACT																					

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**ABSTRACT**

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by

**Andrew Allan Thorburn**

**Captain, US Air Force**

**103 pages**

**Master of Science in Engineering**

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ANDREW ALLAN THORBURN, B.S.C.E.

THESIS

Presented to the Faculty of the Graduate School

of The University of Texas at Austin  
in Partial Fulfillment  
of the Requirements  
for the Degree of

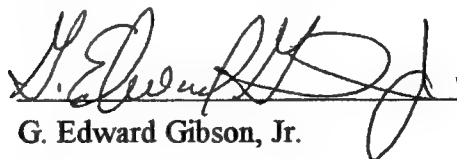
MASTER OF SCIENCE IN ENGINEERING


The University of Texas at Austin  
December, 1994

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**APPROVED BY**

**SUPERVISING COMMITTEE:**

  
G. Edward Gibson, Jr.

  
Richard L. Tucker

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## TABLE OF CONTENTS

	Page
ABSTRACT.....	iii
LIST OF TABLES .....	vi
LIST OF FIGURES.....	vii
CHAPTER 1 INTRODUCTION .....	1
1.1 Motivation .....	1
1.2 Study Objectives .....	2
1.3 Scope.....	2
1.4 Methodology.....	2
1.5 Summary.....	3
CHAPTER 2 BACKGROUND .....	4
2.1 Introduction .....	4
2.2 The History of Design-Build.....	4
2.3 Experiences With Design-Build .....	6
2.4 Advantages and Disadvantages of Design-Build .....	8
CHAPTER 3 RESEARCH METHODOLOGY .....	12
CHAPTER 4 THE AIR FORCE DESIGN-BUILD PROCESS MAP .....	14
4.1 Introduction .....	14
4.2 Phase I: Planning.....	15
4.3 Phase II: Pre-Design Activities .....	23
4.4 Phase III: Develop Request for Proposal .....	30
4.5 Phase IV: Administer Request for Proposal .....	38
4.6 Phase V: Proposal Evaluation and Award.....	40
4.7 Phase VI: Design/Construction.....	47
CHAPTER 5 DESIGN-BUILD PROCESS ANALYSIS.....	53
5.1 Introduction .....	53
5.2 Phase I: Planning.....	53
5.3 Phase III: Develop the RFP .....	57
5.4 Phase V: Evaluation and Award .....	58

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS .....	59
6.1 Conclusions.....	59
6.2 Recommendations.....	60
APPENDIX A: LIST OF ABBREVIATIONS .....	62
APPENDIX B: INTERVIEW SUMMARIES.....	65
Interview Summary: Capt. Patrick Smith, 27 Jul 94, 29 Jul 94.....	65
Interview Summary: Mr. Bill Moritz, 1 Aug 94 .....	67
Interview Summary: Mr. Perry Potter, 2 Aug 94 .....	69
Questionnaire: Mr. Campbell, Mr. Tschoepe, Mr. Leehy, Mr. Walton .....	73
Interview Summary: Mr. Darrell Campbell, 11 Aug 94.....	76
Interview Summary: Mr. Elbert Tschoepe, 11 Aug 94.....	85
Interview Summary: Mr. Larry Leehy, 11 Aug 94 .....	87
Interview Summary: Mr. Cleo Walton, 12 Aug 94.....	92
Questionnaire: Mr. Peer Gerlach .....	95
Interview Summary: Mr. Peer Gerlach, 12 Aug 94 .....	96
BIBLIOGRAPHY .....	99
VITA.....	103

## **LIST OF TABLES**

<b>Table</b>	<b>Page</b>
<b>Table 1. Design-Build Advantages.....</b>	<b>8</b>
<b>Table 2. Design-Build Disadvantages.....</b>	<b>9</b>
<b>Table 2, Continued. Design-Build Disadvantages.....</b>	<b>10</b>
<b>Table 3. The Design-Build Decision.....</b>	<b>21</b>

## LIST OF FIGURES

Figure	Page
Figure 1. AFCEE Construction Management Organization Chart.....	3
Figure 2. Process Map Legend.....	16
Figure 3. Phase I: Planning, Page 1 of 2.....	17
Figure 4. Phase I: Planning, Page 2 of 2.....	18
Figure 5. Phase II: Pre-Design Activities, Page 1 of 2 .....	24
Figure 6. Phase II: Pre-Design Activities, Page 2 of 2 .....	25
Figure 7. Phase III: Develop RFP, Page 1 of 3.....	31
Figure 8. Phase III: Develop RFP, Page 2 of 3.....	32
Figure 9. Phase III: Develop RFP, Page 3 of 3.....	33
Figure 10. Phase IV: Administer RFP .....	39
Figure 11. Phase V: Proposal Evaluation & Award, Page 1 of 2 .....	41
Figure 12. Phase V: Proposal Evaluation & Award, Page 2 of 2 .....	42
Figure 13. Phase VI: Design/Construction, Page 1 of 2.....	48
Figure 14. Phase VI: Design/Construction, Page 2 of 2.....	49



## **CHAPTER 1**

### **INTRODUCTION**

The Design-Build method of project execution has become more popular in the public sector in recent years. Public sector owners have been experiencing more constraints on project budgets in addition to a demand for faster project completion, and many feel that Design-Build will help them in this regard. This thesis is an initial step towards documenting the procedures used in the US Air Force for such projects. The thesis examines the role of the Air Force Project Manager on a "typical" Design-Build project. For the purposes of this thesis, this "typical" project involves the US Army Corps of Engineers or Naval Facilities Engineering Command (NAVFAC) acting as the design and construction agent for the Air Force. The remainder of this chapter summarizes the motivation, purpose, objectives and methodology used for the research.

#### **1.1 Motivation**

The US Air Force (USAF) has been utilizing Design-Build and its variants since authorized by Congress in 1985. On the majority of its Military Construction Program (MILCON) projects, the Air Force uses the US Army Corps of Engineers (USACE) as the Design Agent and Construction Agent. Over the years, there have been various Design-Build guidance documents published by the USACE, but so far none have been produced to outline the Design-Build process for USAF projects. This thesis serves as a cornerstone to the documentation of the Air Force process. The thesis is currently being used by The Air Force Center for Environmental Excellence (AFCEE) to develop a standard guide for project managers, base-level personnel, and other parties involved in the Design-Build process. The guide under development will only address projects for which the Air Force is the agent -- that authority is currently limited to housing projects and five percent of the MILCON program (MOU 1989).

## **1.2 Study Objectives**

The primary objective of this study is to document the key steps in the USAF Design-Build process. Although each project tends to have minor process variations, this guide serves as a good foundation for familiarizing project participants with their various roles. To ease the identification of individual responsibilities, the structured analysis flow chart is used.

A secondary objective is to provide the project manager with information that enables him to decide which situations are appropriate for Design-Build. This planning stage decision has a huge impact on the success of the project, and must be given careful consideration.

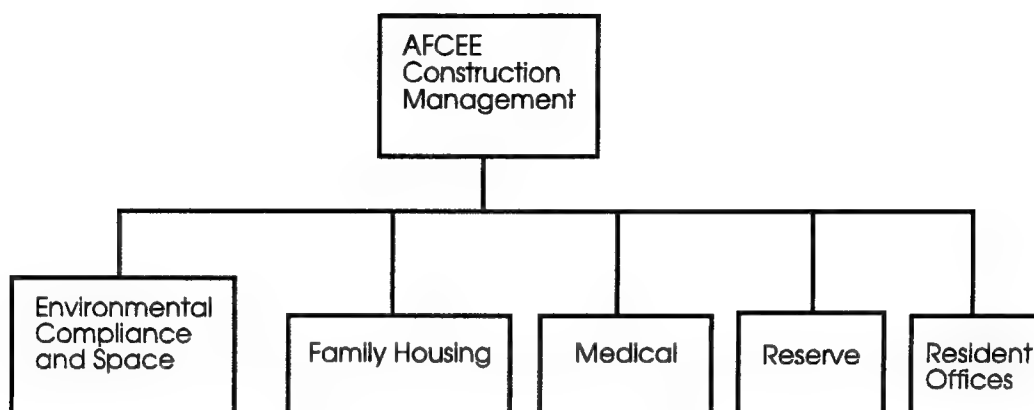
A third objective is to familiarize the reader with the various Design-Build methods being utilized by other government agencies.

## **1.3 Scope**

The process map is developed based upon interviews with project managers in the Construction Management Directorate of AFCEE at Brooks Air Force Base (AFB), Texas. This directorate is broken down into four divisions, as shown in Figure 1. Projects in the Family Housing Division are handled in a manner slightly different than the other divisions due to a separate funding and project approval process. The management team for these projects is also structured differently, since the Air Force is also handling agent-level responsibilities. Therefore, to simplify the presentation of the Design-Build process, the map will not apply to family housing projects.

## **1.4 Methodology**

The research and interviews were broken into three phases as follows. The first phase of interviews and literature review concentrated on familiarizing the author with the concepts and terminology used in Design-Build and reviewing the procedures used by the other federal agencies. The second phase of interviews concentrated on the unique aspects of and potential problem areas in the USAF Design-Build process. The resulting information from these two phases was consolidated into a draft process map.



**Figure 1. AFCEE Construction Management Organization Chart**

The draft process map was reviewed by AFCEE personnel and subsequently forwarded to 3DI Inc. as a starting point for the new AFCEE Design-Build Guide under development. Each step of the draft process map was reviewed and critiqued during a two-day charrette at the 3DI offices. The members of the charrette team included representation from AFCEE, 3DI, and the author. The results of the charrette were incorporated into the final product.

### **1.5 Summary**

The remainder of the thesis is organized as follows. Chapter Two focuses on the lessons to be learned from the available literature. Chapter Three is a detailed explanation of the research methodology, and Chapter Four is the data presentation of the Air Force Design-Build Process Map. The process is analyzed in Chapter Five, while final conclusions and recommendations are presented in Chapter Six.

## **CHAPTER 2**

### **BACKGROUND**

#### **2.1 Introduction**

The preparation for this research involved the examination of journal articles, trade publications, conference proceedings, guidance documents, and case studies. The literature reviewed covered the entire spectrum of Design-Build efforts in the United States, from small private projects to very large government jobs. The primary goal of the review was to become familiar with the processes required in Design-Build projects, especially those in the federal sector. The USACE guidance documents proved especially useful for this purpose, as did the studies performed on Air Force and other federal projects. Supplementary goals included finding "lessons learned" from other projects and developing recommendations for improving the Air Force Design-Build process. The remainder of this chapter will summarize the literature reviewed for this thesis. It begins with a short exploration of the history and growth of Design-Build, examines some specific positive and negative experiences in recent years, explores the advantages and disadvantages of Design-Build, and concludes with a discussion of procurement regulations.

#### **2.2 The History of Design-Build**

The Design-Build method has deep roots in history. The Romans may get credit for the first use of the concept, more precisely referred to as "conquer and build." The master builders of this era would take responsibility of the project from cradle to grave, utilizing the conquered people as construction laborers (Branca 1987). The master builders predominated construction until the early 20th century, when increased competition brought about the concepts of sealed bidding and the separation of design

and construction services. Design-Build saw a re-emergence in the late 1950s due to the effects of high inflation rates on the cost of separate design and construction contracts. Time became increasingly more valuable to both public and private owners, and Design-Build was re-born as a way to shorten project durations.

There are several variations of the Design-Build concept in use today. These are defined as follows:

Turnkey (TK): The owner develops a narrative description of the project, which may include performance specifications and concept drawings. The resulting Request for Proposal (RFP) document is solicited as the contract document for completion of the remaining design and construction. Turnkey projects may also require the proposers to provide project financing and/or property acquisition. The Turnkey contractor must develop nearly 100 percent of the design documentation, and will usually be able to utilize value engineering concepts to maximize the project profitability.

Bridging: The owner develops a more detailed Project Definition (PD) document, which may be likened to design development or a 35 percent design. All functional and aesthetic characteristics are defined in the PD phase, while still leaving latitude for the proposers to find economies in construction technology (Thomsen 1994). The PD documents are solicited as a RFP, and a Design-Build contractor is responsible for completing the design and construction.

Design-Build: As a broad definition, Design-Build applies to any project within the range of 10-35 percent design completion before solicitation of the project documents. The Air Force's use of the concept falls in line with the Bridging method in most cases.

Although Design-Build saw a re-birth in the 1960s, it did not show significant growth in the industry until some 20 years later. The private and public sectors have both been using the concept in housing projects for over 20 years. The real growth came during the management reformation of the early 1980s, when concepts such as Total Quality Management, team-building, alternative dispute resolution, and risk-shifting all added up to the exploration of alternate project delivery methods (McManamy 1994). In looking for ways to save time and money, reduce the

likelihood of litigation, and better allocate the risk on projects, owners have turned to Design-Build.

Design-Build usage has grown dramatically in the public sector, doubling in the last five years (Hogg 1994). The General Services Administration is a big user of Design-Build, committing 33 percent of its FY 91 budget to the method. Design-Build presently accounts for 29 percent of the non-residential construction market in the United States, and is expected to grow to 49 percent by the year 2000 ("For Design/Build" 1994). The Department of Defense is a relative newcomer to the process, having begun general usage on MILCON projects only since FY 85. Successes with Design-Build led Congress in FY 92 to relax legislation that had limited each military service to three Design-Build projects per year (ASCE 1992). This increased authority has led to debate within the services on when Design-Build is most appropriate. This topic is covered in detail in the next section.

### **2.3 Experiences With Design-Build**

As a general rule, the majority of projects in the industry literature accomplished with Design-Build are considered successes by the owner. Most of the controversy and debate in the industry revolves around the changed roles of the contractor and A/E firm, and the associated impact on project risks. Since most Design-Build construction in the federal sector is via firm fixed-price contracts, the risk for cost growth is transferred to the contractor at an early stage in the project. While the owner benefits from this early cost definition, the contractor must work harder to make a profit (Denning 1992).

Design-Build offers the owner a potential for cost and time savings. The City of Oakland, California sponsored a study to compare project execution methods for a 350,000 square foot administration building. Two Design-Build options (competitive selection and open bid) were compared with the Construction Management and Design-Bid-Build approaches. The study showed a potential cost savings of \$13-17 million (20-30 percent) and time savings of 13 months (20-30 percent) with either Design-Build method (Kreikemeier 1994). The Florida Department of Transportation has been studying Design-Build for several years. An interim report prepared in 1990

showed a potential for 10-48 percent time savings by combining design, construction and inspection into a single contract, at little additional cost (Merwin 1990). A University of Florida study backs up those figures. The study, performed on five state highway resurfacing jobs, showed an average time savings of 93 days (30 percent) with Design-Build (Denning 1992).

There are other claims of significant cost savings due to Design-Build, but often these are difficult to compare with traditional Design-Bid-Build costs. Theoretically, the owner should benefit from the contractor's increased opportunity to influence construction costs during design. These projected savings, however, can be offset somewhat by the necessity for a firm fixed-price bid at the Project Definition stage. The owner must not focus on cost savings as the primary goal, but as only one of many potential advantages.

The Air Force's early experience with Design-Build projects was summarized in a 1991 report, "Analysis of USAF Design-Build Procurement." The study analyzed five completed projects -- two dormitories, two complex administrative facilities, and a maintenance facility. The overwhelming response from project participants was that the Design-Build process created a significant administrative burden. All parties, however, considered the projects to be successful in spite of the additional work. Cost savings were not touted as one of the successes, but one participant noted that any savings may have resulted from reduced user group expectations (Engineering-Science 1991). Clearly, a project that requires more detail design during the Project Definition stage will have fewer opportunities for contractor innovation.

Design-Build has been used successfully on several very large, complex buildings in the public sector. The General Services Administration took advantage of competitive technical proposals for its \$500 million Foley Square in New York, NY. The composite courthouse and office building complex required elaborate finishes such as terrazzo floors and marble paneling (Post 1994). The City of Chicago had similar success on its \$145 million Harold Washington Library Center. The city was able to incorporate upgraded ornamental railings, light fixtures and marble wall cladding, and maintain an early known price for the project (Cosgrove 1991).

## **2.4 Advantages and Disadvantages of Design-Build**

There are two critical points in the life of a Design-Build project: the first occurs at the decision of the appropriate execution method, and the second is in the proper preparation of Project Definition documents. Although the Design-Build process could potentially be applied to any project, the drawbacks to such an approach are numerous. Unfortunately, there is often little time and effort expended in making this critical decision, as it can be driven by political influences. The following tables should give pause to the decision process and generate discussion about applicability.

**Table 1. Design-Build Advantages**

<b>Key Word</b>	<b>Description</b>
Relationships	The system is less adversarial and easier to manage (Hogg 1994; Potter 1994a)
Communications	The process fosters better communications between all parties (Hogg 1994; Potter 1994a)
Continuity	Continuity of project management is enhanced, resulting in increased timeliness and efficiency of the entire project (Songer et al. 1992)
Responsibility	There is a single entity responsible for design and construction (ASCE 1992; McManamy 1994; Hogg 1994; Potter 1994a)
Cost	The costs to develop the solicitation documents are reduced (Potter 1994a)
Cost, Time	There is a potential to significantly reduce construction costs by incorporating the main precepts of Total Quality Management, fast-tracking, and partnering between all parties (Tarricone 1993)
Time	There is greater potential for fast-tracking and the associated time savings (ASCE 1992; Hogg 1994; Potter 1994a)
Time	The project can be ready to advertise in less time (Potter 1994a)
Innovative Design	The owner and contractor are able to influence design with procurement; the potential for proprietary design exists (Thomsen 1994)
Competition	The process fosters competition through innovation (ASCE 1992; Tarricone 1993; Potter 1994a)
Quality	The owner can award the project to the proposer offering the best value, not necessarily the lowest price (Potter 1994a)
Changes	There are fewer construction change orders (ASCE 1992; Hogg 1994)
Risk	There are earlier price and schedule guarantees (McManamy 1994; Hogg 1994)
Claims	Claims and litigation are limited by proper allocation of risk between all parties (Tarricone 1993)
Litigation	There is less potential for court action or dispute mediation (McManamy 1994; Hogg 1994; Thomsen 1994; Dreger 1994)
Litigation	The owner is protected from liability for design errors and omissions (ASCE 1992)



**Table 2. Design-Build Disadvantages**

<u>Key Word</u>	<u>Description</u>
Relationships	The A/E may not be able to meet the traditional fiduciary role for the owner (Hoyt 1993).
Relationships	Owners say the advice given by an A/E under a Design-Build arrangement is different than would be under a traditional arrangement (Hogg 1994).
Relationships	The Design-Build A/E's allegiance is to the contractor, not the owner (Hoyt 1993).
Communication	The A/E can lose the traditional direct communication with the client (Setzer 1991; "For Design/Build" 1994).
Control	The A/E loses control over cost versus quality issues ("For Design/Build" 1994).
Control	The owner loses project control (Setzer 1991).
Cost	The cost of preparing a proposal can be expensive, thereby reducing competition (Potter 1994a).
Cost	Much of the design cost is paid for with construction funds, resulting in reduced funds available for construction unless adjusted (Potter 1994a).
Cost	There is a possibility of short-term cost considerations outweighing long-term, life-cycle costs (Setzer 1991; ASCE 1992).
Risk	Contractor must take on significantly higher risks, therefore his price might reflect it (Denning 1992).
Time	The Source Selection process is long and tedious and requires a dedicated team for an extended period of time (Potter 1994a).
Time	Design-Build can take much longer to get to contract award than traditional methods (Potter 1994a).
Creativity	Fixing the design at the Project Definition stage inhibits creativity, stagnates the normal design process, and discourages the search for alternate designs (Branca 1987; "For Design/Build" 1994).
Competition	Design-Build reduces competition compared to the traditional method, and smaller firms may not be able to compete (Bradford 1991; Hogg 1994).
Competition	Smaller A/E firms have less clout when partnering with large contractors (Hogg 1994).
Quality	The quality of the final product may not meet the owner's expectations (Potter 1994a).
Changes	Scope changes are difficult to identify (Songer, et. al. 1992).
Changes	Changes after contract award can be expensive (Potter 1994a).
Early Definition	It may be difficult to define needs in terms of quality levels, function and cost expectations for the project (Potter 1994a).
Expertise	The process requires more expertise than the traditional method, and is critical for preparation of the RFP, technical reviews, proposal evaluation and contracting (Potter 1994a).
Subcontractor	Subcontractors generally dislike the process because they don't know what will surround their work and what may affect it at the time of bidding (Denning 1992).

**Table 2, Continued. Design-Build Disadvantages**

<u>Key Word</u>	<u>Description</u>
Bonding	Bond rates for contractors can be up to 50 percent higher (Denning 1992).
Laws	Some states prohibit the use of Design-Build (Schoumacher 1990; Denning 1992).
Uncertainty	It is possible to have no acceptable proposals (Potter 1994a).

The Project Management Team should consider all of the above statements before committing the project to Design-Build. Because Design-Build has been successful in the past, it is often difficult to recognize the many disadvantages of the method. Additional restrictions on selecting Design-Build delivery are detailed in the Federal Acquisition Regulation (FAR) Part 6.401 (USACE 1993a). The FAR states that Contracting Officers shall solicit sealed bids if the following four conditions can be met:

- Time permits the solicitation, submission, and evaluation of sealed bids;
- The award will be made on the basis of price and other price-related factors;
- It is not necessary to conduct discussions with the responding offerors about their bids; and
- There is reasonable expectation of receiving more than one sealed bid.

If Design-Build is the desired method, the Contracting Officer is required to explain which of the above conditions cannot be met.

Procurement regulations have a profound affect on the ease of administering a design and construction contract. The regulations are so burdening that Contracting Officers become discouraged by real and perceived barriers in the FAR, preventing them from trying new contracting methods (Moore and Neve 1989; "For Design/Build" 1994). Vice President Gore's National Performance Review identifies procurement reform as one of the nation's goals. The wide-reaching procurement reform bill will authorize increase usage of two-step selection procedures for Design-Build projects ("Procurement" 1994). The bill has generated considerable backlash

from the A/E community on the perception that two-step selection procedures amount to bidding for design services. The final bill should be a compromise between the provisions of the Brooks Act (ensures quality-based selection of A/E services) and the freedom to use Design-Build (Charles 1994).

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

All research for this thesis was accomplished with the assistance of AFCEE's Construction Management Directorate. A research proposal was presented to Mr. Darrell Campbell, Chief of the Reserve Division, and Mr. Larry Leehy, Acting Chief of Construction Management, on July 26, 1994. The first step of the research for the Design-Build Process Map was a review of Design-Build procedures in other federal agencies. Since most of the Air Force's MILCON program is handled by the US Army Corps of Engineers, the documentation on Corps procedures was closely examined. One document in particular, The Request for Proposal Process (USACE 1993a), served as a good starting point for comparing USACE methods with Air Force variants. This document, a step-by-step flow chart of revised USACE Design-Build procedures, was reviewed in detail on two separate occasions with Capt. Patrick Smith, Deputy Chief of the Reserve Division. Capt. Smith suggested several changes to the process based upon his experiences with the ongoing Homestead Air Reserve Base projects.

A rough process map was developed based upon Capt. Smith's variants. To test the validity of the new process, interviews were conducted with Mr. Bill Moritz, Project Manager in the Reserve Division, and Mr. Perry Potter, Chief of the Family Housing Division. After offering their opinions of the process, both Mr. Moritz and Mr. Potter answered general questions about Design-Build.

These three interviews gave the author a general familiarity with Air Force terminology and procedures, and led to further questions about Design-Build. The questionnaire was revised, and interviews were conducted with Mr. Darrell Campbell, Mr. Larry Leehy, and Mr. Elbert Tschoepe, Chief of the Environmental Compliance and Space Division. The final two interviews were with Mr. Cleo Walton, Project

Manager in the Medical Division, and Mr. Peer Gerlach, Project Manager in the Family Housing Division. All interviews were recorded and transcribed, and are presented in Appendix B.

Upon completion of the interviews, the process map was revised and regenerated in the format of the deployment flow chart. The draft process map was submitted to AFCEE, and a review meeting was held in early September. Attendees at the meeting were as follows: Mr. Leehy, Mr. Potter, Mr. Campbell, and Capt. Terry Edwards, Deputy Chief of the Environmental Compliance and Space Division. The reviewers provided consolidated comments on the first half of the process map. Separate written comments were received from Capt. Smith and Mr. Leehy.

In September, AFCEE awarded a contract to 3DI, Inc. to develop a Project Manager's Guide for Design-Build. The initial "design charrette" for this contract was held on October 12-13, 1994. During these two days, each step of the draft process was reviewed in detail. The author circulated an updated version of the process map to all present. Attendees included Capt. Smith, Mr. Moritz, Mr. Walton, Maj. John French, Project Manager for the Design-Build Guide, Mr. Frank Castaneda, Project Manager in the Environmental Compliance and Space Division, Mr. Tom Olmstead (3DI), Mr. William Turner (3DI), and Mr. Dan Haas (3DI). Comments from this meeting were incorporated into the third and final revision of the process map.

Chapter Four, The Air Force Design-Build Process Map, contains this final revision. This thesis has been submitted to AFCEE for further use during development of the Design-Build Guide. Since the Design-Build Guide is focusing only upon projects for which the Air Force is the agent, the people involved will differ slightly from this thesis. The concepts and required actions, however, are nearly identical.

## **CHAPTER 4**

### **THE AIR FORCE DESIGN-BUILD PROCESS MAP**

#### **4.1 Introduction**

The process of accomplishing a Design-Build project incorporates many of the standard methods used on conventional Design-Bid-Build projects. The Project Manager's Guide for Design and Construction (USAF 1991; also referred to as the Blue Book) and The USAF Project Manager's Guide to Project Definition (USAF 1993) are two sources of detailed information on the MILCON process. This process map is not intended to replace either guide, but should be viewed as a supplement to these sources.

This process map is developed to be applicable for the majority of Air Force MILCON projects. The typical MILCON project may satisfy requirements for a new mission, base closure or realignment, environmental compliance or emergency repair. These projects utilize the US Army Corps of Engineers or the Navy Facilities Engineering Command as the Design and Construction Agent. With slight modification, the process map can be applied to Family Housing projects. These projects utilize the Turnkey method of delivery more often and have different funding and approval cycles.

In any case, the process is broken into six distinct phases as follows:

Phase I: Planning, Steps 1-6

Phase II: Pre-Design Activities, Steps 7-21

Phase III: Develop RFP, Steps 22-39

Phase IV: Administer RFP, Steps 40-43

Phase V: Proposal Evaluation and Award, Steps 44-50

Phase VI: Design/Construction, Steps 51-62

Each of these phases is illustrated using the deployment flow chart. As Figure 2 illustrates, the chart has a responsibility bar across the top, indicating the key players and/or organizations for each phase. The horizontal position of an activity indicates who holds the primary responsibility for that action. Diamonds represent decision steps and rectangles represent required activities. Circles are used to show who contributes at each step (Oswald and Burati 1992).

A narrative describing each step in the process follows the deployment flow chart for that phase. The narrative also defines the key players and abbreviations for each phase.

#### **4.2 Phase I: Planning**

The Air Force Design-Build Process Map begins with the planning phase, consisting of six major steps. The phase is illustrated in two figures. Figure 3 captures the process through Design-Build method approval and revision of the DD Form 1391. Figure 4 continues the Requirements and Management Plan (RAMP) process and ends with submittal of the planning documents to the Design Agent.

The key features of this initial phase are the Design-Build decision and the development of the Project Management Plan. There are many programming activities that are not detailed in this phase for the sake of brevity. The Air Force Project Manager should consult the Blue Book for a thorough representation of MILCON project programming and approval steps.

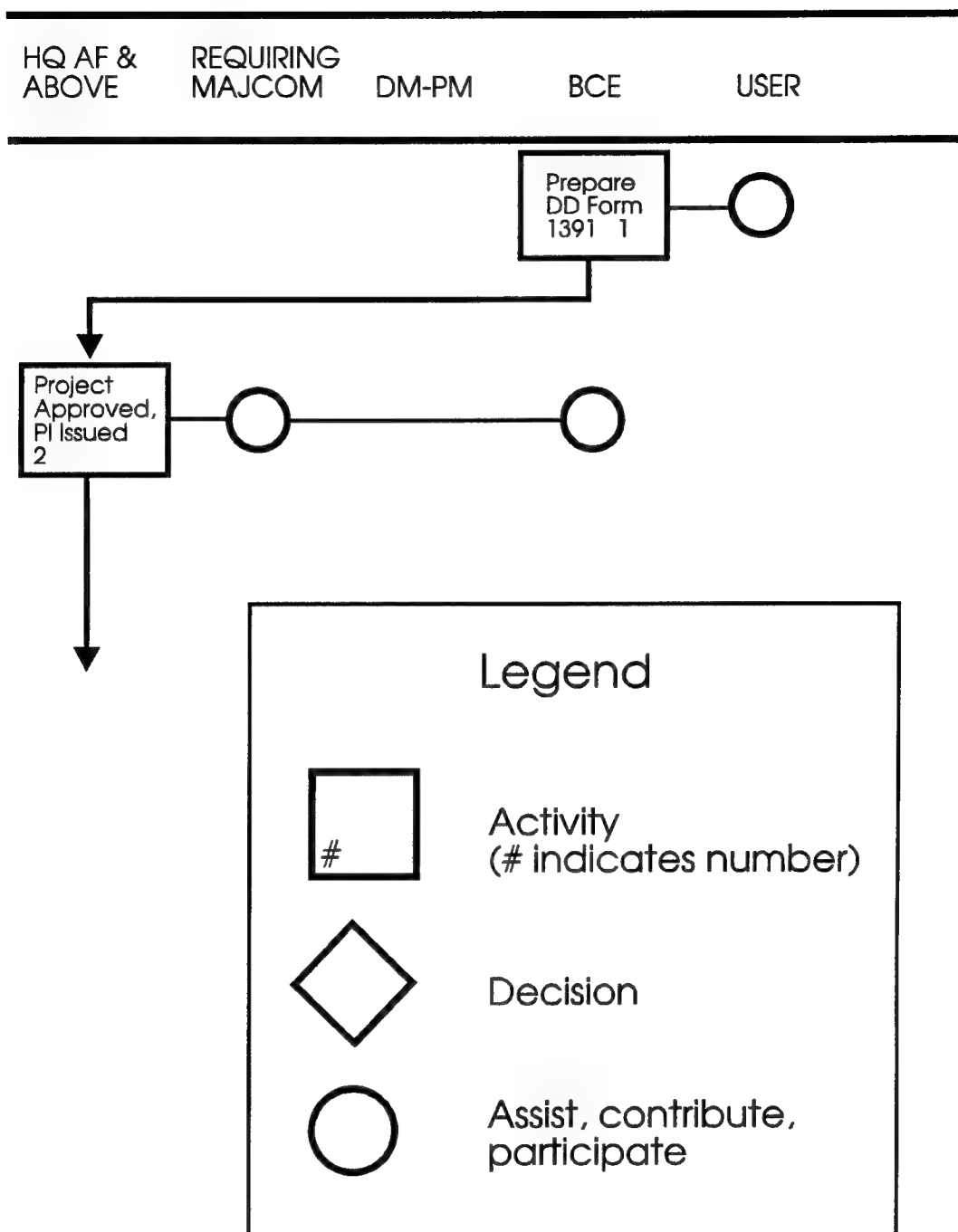
##### **Key Team Members:**

*HQ AF & Above:* Includes the Air Force Civil Engineer (AF/CE), the Secretary of the Air Force, the DOD, Congress, and the President.

*Requiring MAJCOM (RMC):* The Air Force Major Command sponsoring/funding the project. The host MAJCOM, if different, should interact with the Requiring MAJCOM, the BCE and the user.

*DM-PM:* The Air Force Project Manager responsible for executing the project from concept up to award of the Design-Build contract.

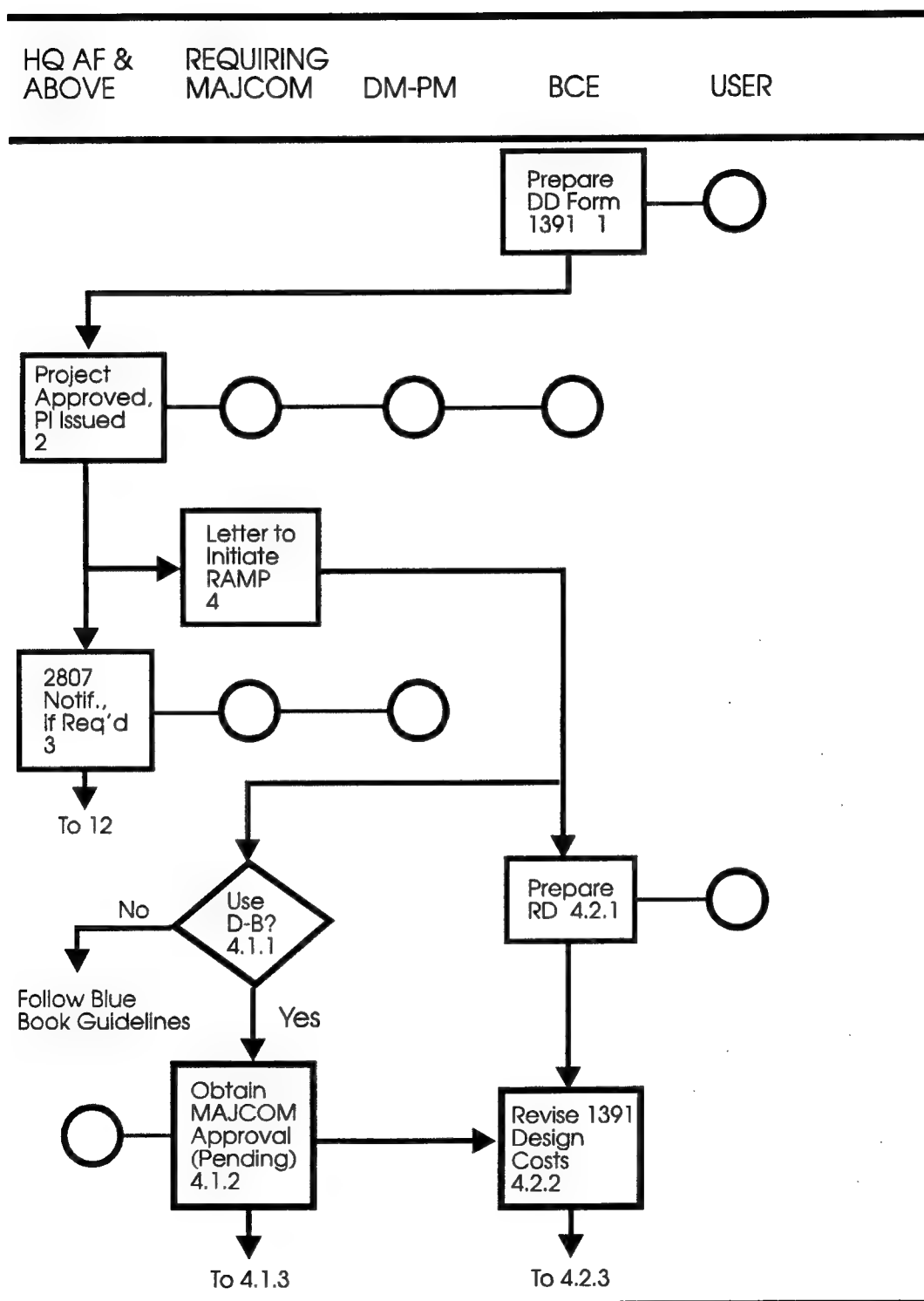
*BCE:* The Base Civil Engineer and his representatives at the host base.

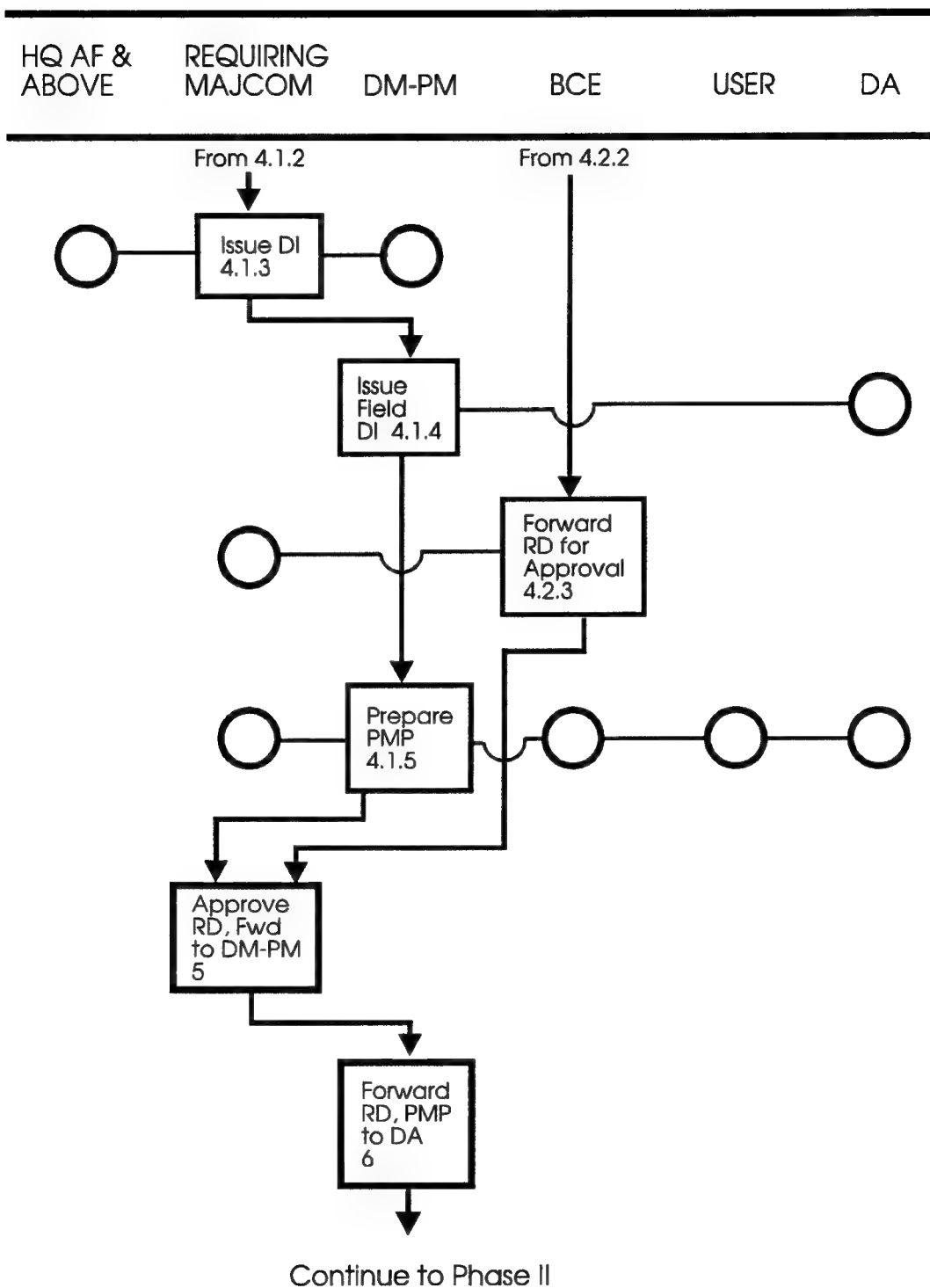


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**Figure 2. Process Map Legend**



**Figure 3. Phase I: Planning, Page 1 of 2**

**Figure 4. Phase I: Planning, Page 2 of 2**

*User:* The organizations that will live and work in the facility. Also includes MAJCOM representation for these organizations.

*DA:* The Design Agent for the project, responsible for executing the contracts. On most Air Force projects, the US Army Corps of Engineers (USACE) fills this role. USACE representation includes the Major Subordinate Command and the District Program Manager.

**Abbreviations:**

A/E - The Architecture and Engineering Firm  
 BCP - Base Comprehensive Plan  
 CBD - Commerce Business Daily  
 DA - Design Agent  
 DI - Design Instruction  
 FAR - Federal Acquisition Regulation  
 PA - Programmed Amount  
 PCE - Parametric Cost Estimate  
 PI - Planning Instruction  
 PMP - Project Management Plan  
 PMT - Project Management Team  
 RAMP - Requirements and Management Plan  
 RD - Requirements Document  
 RFP - Request for Proposal  
 RMC - Requiring Air Force Major Command (MAJCOM)  
 SDB - Small Disadvantaged Business

1. Prepare DD Form 1391: The BCE at the host base initiates the MILCON process by preparing this programming document. The DD Form 1391 (hereinafter referred to as the 1391) includes a description of the user's requirements, a justification for the project, detailed costs, a site plan, and environmental certifications. There are many actions the BCE must undertake before developing the 1391, including validating the user's requirements, and coordinating the proposed development with

the Base Comprehensive Plan (BCP). This step also includes project approval and prioritization by the base's Facilities Utilization Board and the Host MAJCOM (if the same as the RMC).

2. Project Approved, Planning Instruction (PI) Issued: The RMC submits its prioritized MILCON listing to AF/CE for approval. Once approved, AF/CE issues a PI to the RMC, with a copy to the DM-PM. The DM-PM then forwards the PI to the Design Agent by way of a transmittal letter. The PI authorizes the start of the Project Definition (PD) process, subject to the limits listed in Step 4.1.3, Issue DI (USAF 1991).

3. 2807 Notification to Congress, if required: If the A/E fee is estimated to be greater than \$300 thousand, Congress must be notified. HQ AF initiates this process automatically, based upon the programmed amount (PA) in the project's 1391. The notification will take 30-45 days, and must be initiated prior to issuance of the Commerce Business Daily (CBD) announcement (USAF 1991). In accordance with Air Force Instruction 1023.31, the notification process must be completed before awarding an A/E contract.

4. Letter to Initiate Requirements and Management Plan (RAMP): Upon receipt of the PI, the RMC sends this letter to the DM-PM and the BCE, authorizing start of the RAMP process. The RAMP consists of two separate documents, the Requirements Document (RD) and the Project Management Plan (PMP). The RAMP process encompasses Steps 4.1.1 through 4.1.5 and 4.2.1 through 4.2.3, as detailed below.

4.1.1. Use Design-Build Strategy? This decision involves all members of the Project Management Team (PMT). Together, they need to answer the questions in Table 3. The likelihood of success for a Design-Build project increases with each "yes" answer. This table is intended as a quick summary of major concerns on a Design-Build project. A detailed presentation of advantages and disadvantages was presented in Chapter Two, and specifically

in Tables 1 and 2. The Contracting Officer must also abide by the restrictions of the FAR in justifying the use of Design-Build. These details are also presented in Chapter Two. If the project is not a good Design-Build candidate, the PMT should follow the guidance in The Project Manager's Guide for Design and Construction.

**Table 3. The Design-Build Decision**

Consideration	Questions to Answer
Time	Does the project require fast-track construction?
User Needs	Are the user's requirements compatible with commercial-sector construction? Are the requirements fixed, and can they be adequately defined through performance specifications?
Funding	Will construction funds be available in 8-11 months?
Project Management Team	Is the PMT experienced with Design-Build? Are all members of the PMT (especially the Agent) able to accommodate the increased workload during PD and contractor selection?
Contractor Concerns	Are contractors in the area familiar with the Design-Build process? Have Design-Build projects been successful at this base? Has a market survey been performed to determine current interest in Design-Build?

4.1.2. Obtain MAJCOM Approval (Pending): The authority to proceed with a Design-Build project currently rests with the AF/CE, but is in the process of being delegated to the MAJCOMs. The DM-PM should seek approval from the RMC, Office of The Civil Engineer.

4.2.1. Prepare Requirements Document: The BCE is responsible for preparing the RD, which will contain the following information (USAF 1990):

- A detailed project description, including special user requirements
- Base standards and regulations applicable to construction, including architectural guidelines
- Identification of environmental issues
- Integration of the project into the BCP

- Site investigation and supporting utility requirements
- A Parametric Cost Estimate (PCE)

4.2.2. Revise 1391 Design Costs: If the 1391 was not written for Design-Build delivery, revision may be necessary. The cost of design in a Design-Build project will be funded with two "pots" of money: Approximately 2.5-4 percent of design money for Request for Proposal (RFP) preparation, and approximately 6 percent of construction money to complete the design. The PA for construction should be increased, since some of this money will now be used for design.

4.1.3. Issue Design Instruction (DI): The RMC DI is the authority to start Architecture/Engineering Firm (A/E) selection and award, site investigation and design. It may indicate the potential for using the Design-Build process. It also establishes the limit for how far the design will proceed:

- Three percent: Selection of A/E, Criteria Review Conference (CRC) and negotiations, but contract cannot be awarded.
- Four percent: A/E contract awarded.
- PD: Completion of Project Definition -- sufficient design to provide a PCE and a presentation to the user (USAF 1991).
- 100 percent: RFP documents completed. Design may vary from 10-35 percent complete, depending upon project.

4.1.4. Issue Field Design Instruction: For every DI that is received by the Air Force PM from the RMC, a Field DI is issued to the Design Agent. This also applies to the Construction Agent during Phase VI. The initial DI will include the PA, construction cost limitation, scope, 1391, level of design authorization as defined above, and the user need date (USAF 1994).

4.2.3. Forward Requirements Document for Approval: The BCE forwards the completed RD to the RMC for approval.

**4.1.5. Prepare Project Management Plan:** The PMP identifies the project management team and the strategic decisions made on the project. Strategic decisions include the responsibility for design, determination of project risk, the contract type, project packaging decisions, and Small Business Administration and/or Small Disadvantaged Business (SDB) participation decisions (USAF 1991). In addition, the PMP will identify environmental milestones, identify the need for a charrette, determine required design reviews, establish the project design and construction schedule, and identify Air Force milestones (USAF 1994).

**5. Approve Requirements Document, Forward to DM-PM:** The RMC reviews and approves the RD, then forwards the document to the Air Force PM.

**6. Forward RD, PMP to Design Agent:** The Air Force PM forwards the completed RD and a draft copy of the PMP to the Design Agent. This must be accomplished no later than 30 days after delivery of the initial Field DI (USAF 1994). The PMP is completed during the Pre-Criteria Review Conference (Step 16).

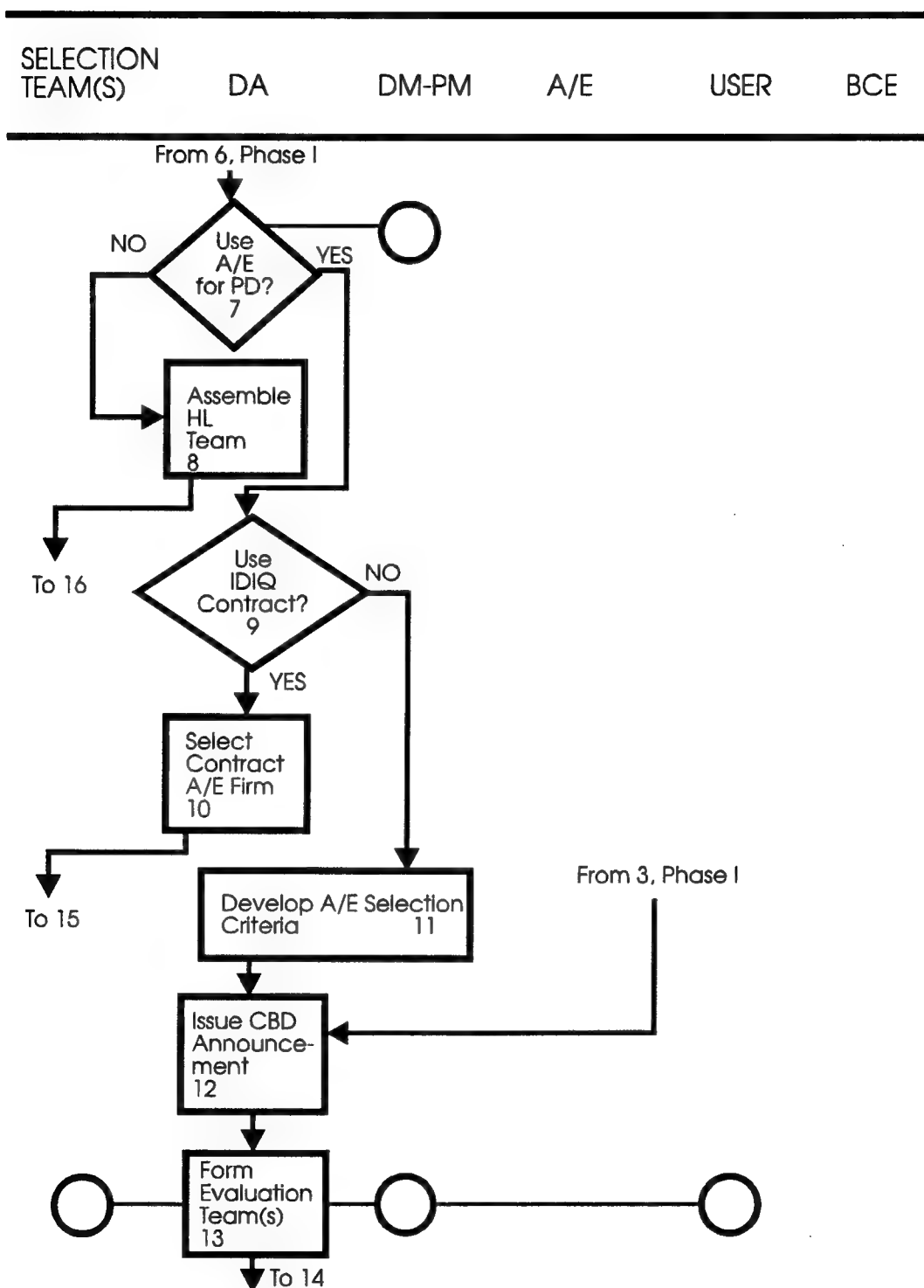
#### **4.3 Phase II: Pre-Design Activities**

The products of Phase I, the Requirements Document and the Project Management Plan, are carried forward to the next phase, Pre-Design Activities. The process is illustrated in Figures 5 and 6.

The focus of the second phase is to select an A/E firm to prepare the Project Definition package. This phase is greatly simplified by using an Indefinite Delivery, Indefinite Quantity (IDIQ) contract for A/E services. In some cases, the Design Agent's in-house personnel may be used for Project Definition. This has been the exception rather than the rule.

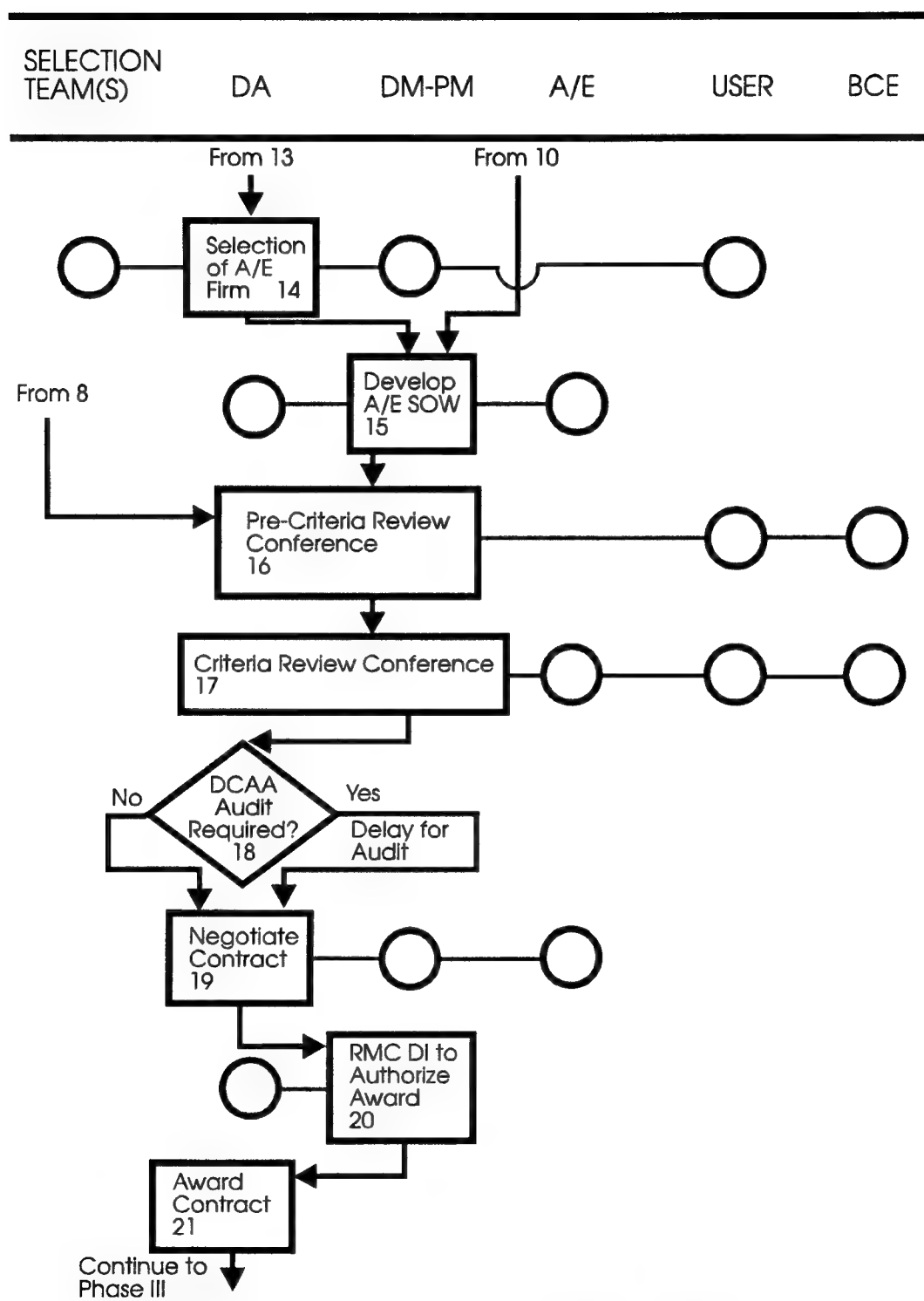
#### **Key Team Members:**

*Selection Team(s):* Those personnel responsible for selecting the A/E firm, if an IDIQ contract is not used.



**Figure 5. Phase II: Pre-Design Activities, Page 1 of 2**





**Figure 6. Phase II: Pre-Design Activities, Page 2 of 2**

**DA:** The Design Agent for the project, responsible for executing the contracts. On most Air Force projects, the US Army Corps of Engineers (USACE) fills this role. USACE representation includes the Major Subordinate Command and the District Program Manager.

**DM-PM:** The Air Force Project Manager responsible for executing the project from concept up to award of the Design-Build contract.

**A/E:** The Architecture and Engineering Firm(s) developing the RFP package.

**User:** The organizations that will live and work in the facility. Also includes MAJCOM representation for these organizations.

**BCE:** The Base Civil Engineer and his representatives at the host base.

#### **Abbreviations:**

DCAA - Defense Contracting Audit Agency

HL - Hired Labor, the term used for the DA's in-house personnel

IDIQ - Indefinite Delivery, Indefinite Quantity

SOW - Statement of Work

7. Use A/E for Project Definition?: The PMT should decide how the PD documents will be prepared -- either by utilizing the Design Agent's personnel or by hiring an A/E firm. The following factors should be considered:

- The ability of the DA to commit a dedicated team for the entire PD phase
- The expertise of the available DA design team
- Scheduling constraints

8. Assemble Hired Labor (HL) Team: The DA should form an in-house team that will be able to stay together as a unit during the entire PD phase. Consistency of decision making is critical during PD, so vacation schedules and other project requirements must be examined for each member of this team. After the team has been chosen, the project can continue to the Pre-Criteria Review Conference (CRC) (Step 16).

9. Use IDIQ Contract?: There are tremendous advantages to establishing and using IDIQ contracts for the Project Definition phase. These advantages are in the ability to execute the contract quickly and with the firm's growing familiarity with the Air Force Design-Build process. It is highly recommended that MAJCOMs establish such contracts.

10. Select Contract A/E Firm: This step assumes that the MAJCOM or Design Agent has several IDIQ contracts to choose from. Selection factors to be considered include the A/E's familiarity with the host base, his workload, and experience with the Air Force Project Definition procedures. An A/E that has experience as the designer of record on Design-Build projects will bring valuable expertise to the project, as the firm will be familiar with how Project Definition documents are interpreted. Once the firm is selected, the Statement of Work (SOW) is developed (Step 15).

11. Develop A/E Selection Criteria: If the IDIQ contract is not used, a quality-based selection process will determine which firm the PD contract is awarded to. The PMT should look at the factors identified in Step 10, as well as incorporating project-specific requirements into the criteria.

12. Issue CBD Announcement: This project synopsis is the primary method of attracting proposers, so it must be accurate. The announcement should indicate the approximate level of design that will be required for each element of the project, if it will vary. For example, if user needs will require an 80 percent level of design for interior work but only 15 percent on all other systems, this information would help the A/E structure his proposal to more accurately fit the project needs. The synopsis should briefly detail the Design-Build process and mention that the offeror's experience on similar projects will be an evaluation factor. The project's cost range and any proposed options should also be included in the synopsis to prevent awardability problems. If subsequent scope changes exceed the advertised range, the project may be delayed for re-advertisement (Potter 1994b). A final statement should indicate that the selected firm will not be eligible to compete as part of a Design-Build team on this project. The other means of identifying proposers is consideration of A/E firms who

have submitted proposals for previous projects. Files containing the appropriate qualification forms are maintained for one year. If qualified, these firms will be automatically considered, and need not respond to the CBD announcement (Smith 1994).

13. Form Evaluation Team(s): The Evaluation Team(s) should be composed of representation from the Design Agent, the Air Force PM, and the RMC. Representatives should be registered professional architects and engineers. The user may also be involved if there are unique requirements to be evaluated.

14. Selection of A/E Firm: This quality-based selection process, governed by the Brooks Act, will involve reviewing and evaluating proposals, identifying deficiencies and seeking clarifications. Proposers may be interviewed as part of the selection process, which will take a minimum of three weeks.

15. Develop A/E Statement of Work: Development of the SOW should begin soon after the decision is made to use an A/E firm. It is now finalized and forwarded to the A/E, so the firm can develop questions for the CRC (Step 17).

16. Pre-Criteria Review Conference: This conference, also called the Government-Only Review Meeting, is called to finalize the PMP and to ensure a unified government position on the design requirements.

17. Criteria Review Conference: The primary purpose of this conference is to convey the project criteria to the A/E firm (or HL team). This conference may also be referred to as the Predefinition Conference in other literature. Items for discussion include the functional requirements, government-furnished material and equipment, equipment data, utility plans and capacities, scheduling milestones and constraints, environmental considerations, and design background information (USAF 1994). The A/E SOW is discussed and finalized at this meeting. If there is more than one user for the project, the commanders from each of these agencies should attend this meeting. The DM-PM should emphasize to these commanders that all requirements must be

identified during the Project Definition phase, and that subsequent changes will not be tolerated. A detailed list of discussion items is identified in Appendix A of the Blue Book (USAF 1991).

18. Defense Contracting Audit Agency (DCAA) Audit Required?: After the CRC, the A/E submits its proposed fee to the Design Agent. If the estimated A/E fee is greater than \$500 thousand and the selected firm does not have a recent (within 12 months) audit on file with the DCAA, this audit must be performed. The audit examines the firm's man-hour and overhead rates. If required, the process will delay the project by approximately six weeks (USAF 1991). If the A/E has been previously audited by another agency, such as the Air Force Audit Agency, the Design Agent may petition the Contracting Officer to accept this instead of the DCAA audit (Smith 1994).

19. Negotiate Contract: Within ten days of the CRC, the Design Agent develops the initial government design cost estimate and submits it to the DM-PM (USAF 1994). The "target" cost for RFP preparation is 2.5-3 percent of the programmed amount, with approximately 1 percent higher costs for unique requirements like detailed Comprehensive Interior Designs. The A/E proposal is evaluated by both the DA and the DM-PM, and compared to the government estimate. The government estimate should be closely examined with regard to the expected level of design, as this is not a standard A/E effort. The design cost is finalized in the negotiations.

20. RMC DI to Authorize Award: If the original DI had a "design to" limit of three percent, additional authority is needed to continue (USAF 1991). Although not shown here for simplicity, the DM-PM issues a Field DI to the Design Agent for each RMC DI received (see Step 4.1.4.).

21. Award Contract: The final step in the Pre-Design Activities Phase is to obligate the design funds. The project now moves into Phase III, Develop RFP.

#### **4.4 Phase III: Develop Request for Proposal**

Phases I and II can be considered preparatory -- while they are both important to the success of a Design-Build project, nothing has yet been accomplished towards getting the design or construction started. Phase III, depicted graphically in Figures 7-9, is the beginning of the critical procedure of transcribing user requirements into a constructable engineering project.

The initial effort in this phase, the preparation of the Project Definition documents, essentially follows the guidelines established in The US Air Force Project Manager's Guide to Project Definition (USAF 1993). There is one noted exception: the Using Agency has been moved from the Core Team to the Base Support Team to emphasize continued user involvement in the charrette process. The format for the Project Definition documents on a Design-Build project will be slightly different than described in the above guide. Since the Project Definition package will become an essential portion of the solicitation documents, the format must closely match the Request for Proposal requirements.

#### **Key Team Members:**

*Decision Makers:* Base Commander, Base Civil Engineer, Using Agency Commander, MAJCOM representatives.

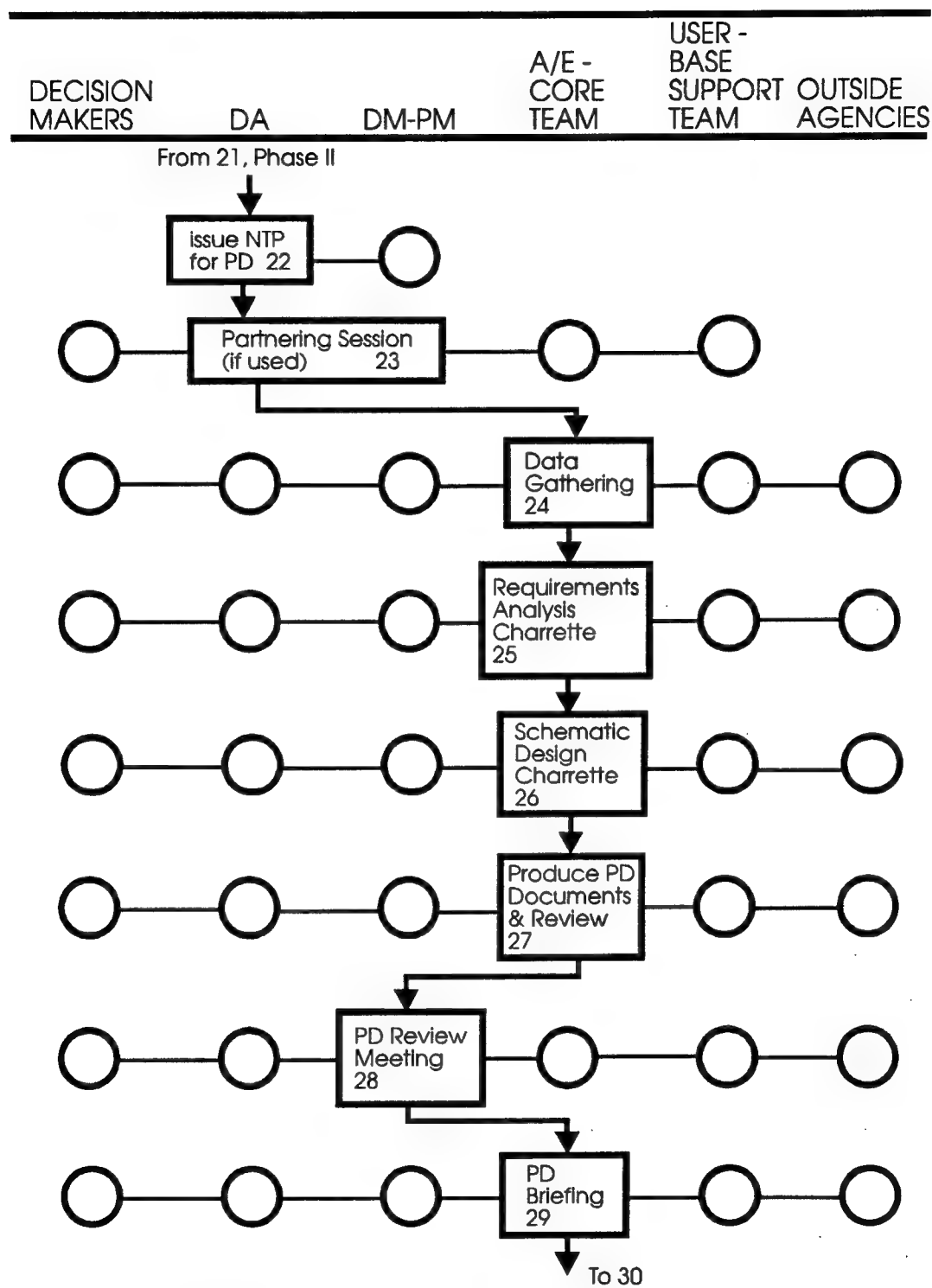
*DA:* The Design Agent for the project, responsible for executing the contracts. On most Air Force projects, the US Army Corps of Engineers (USACE) fills this role. USACE representation includes the Major Subordinate Command and the District Program Manager.

*DM-PM:* The Air Force Project Manager responsible for executing the project from concept up to award of the Design-Build contract.

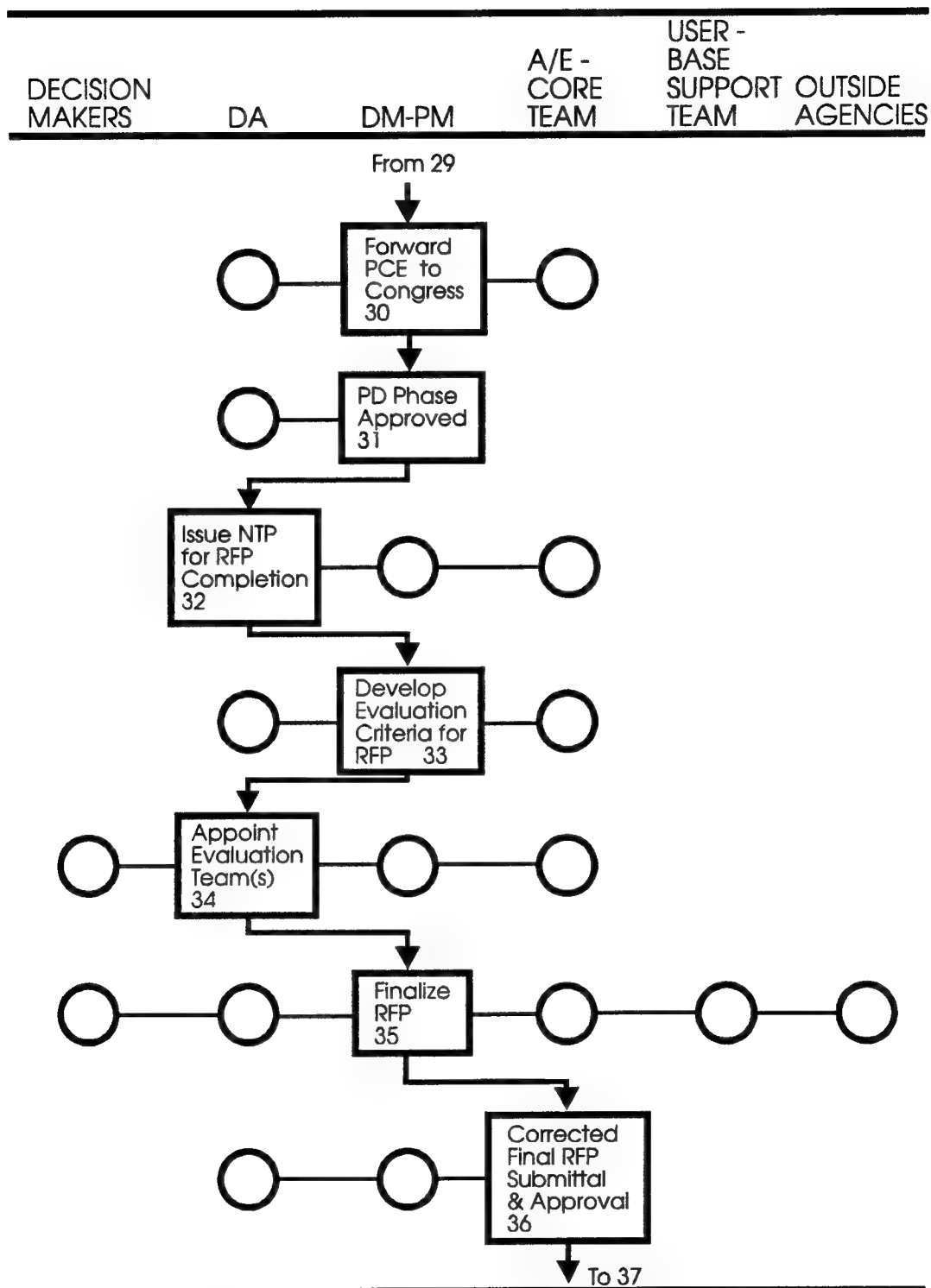
*A/E - Core Team:* A/E Firm, Contracting Officer, BCE Project Manager.

*User - Base Support Team:* Using agency representative, Security Police, Communications, Fire Chief, Environmental Management, Bio Environmental Management, Safety, other shop representatives when appropriate.

*Outside Agencies:* Historical, Environmental Protection Agency, Utility Companies, other regulatory agencies.

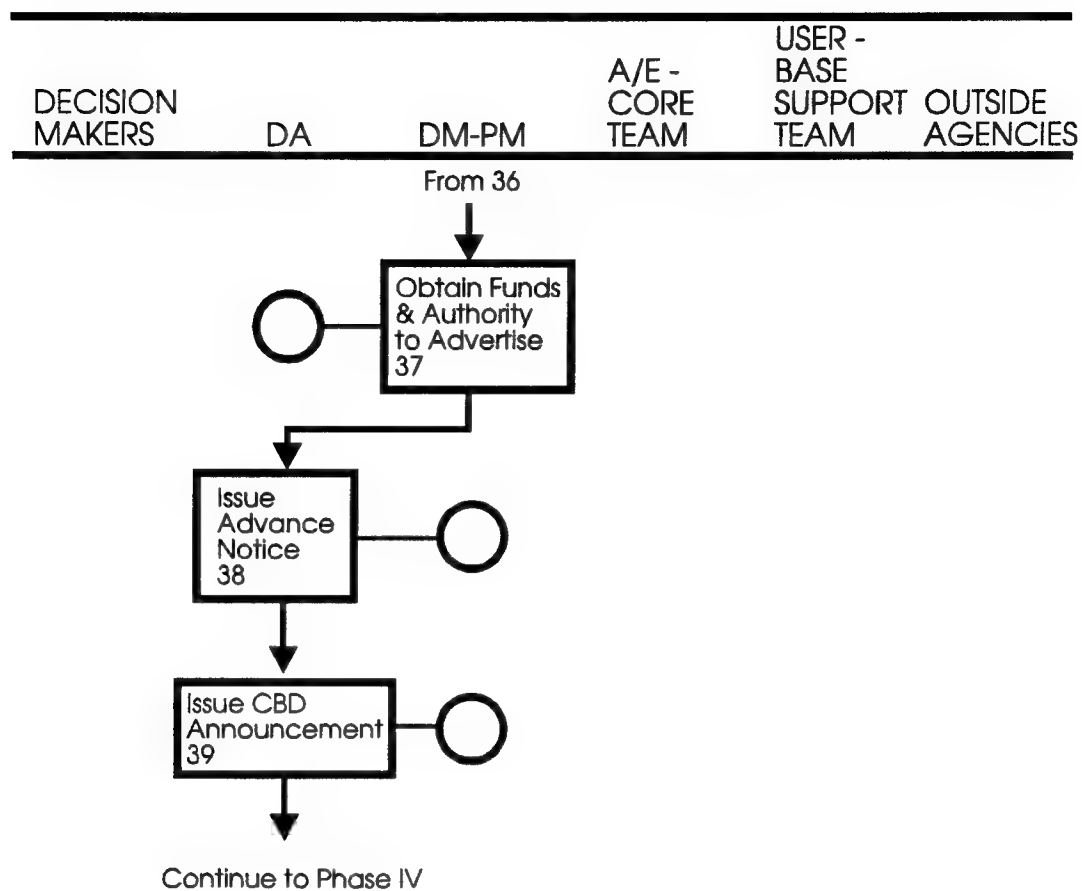


**Figure 7. Phase III: Develop RFP, Page 1 of 3**



**Figure 8. Phase III: Develop RFP, Page 2 of 3**





**Figure 9. Phase III: Develop RFP, Page 3 of 3**

**Abbreviations:**

BES - Budget Estimate Submittal

NTP - Notice to Proceed

PDC - Programming, Design, and Construction -- the Air Force MILCON project computer database

RTA - Ready to Advertise

SSA - Source Selection Authority

22. Issue Notice to Proceed (NTP) for Project Definition: The design phase of the project begins when the NTP is issued by the DA's Contracting Officer. The goals of project definition are to firm-up all technical and functional requirements, resolve siting issues and comply with the Base Comprehensive Plan, and revise or validate the PCE for the RAMP (USAF 1991).

23. Partnering Session (if used): The decision on the use of partnering is identified in the PMP. The partnering session will utilize an experienced facilitator to establish mutual goals and objectives for the project. Areas of focus for the partnering effort can include exceeding quality goals, avoiding litigation, meeting budgets, exceeding safety standards, and meeting the project schedule (USAF 1994).

24. Data Gathering: Leadership of the project now shifts to the A/E. While the A/E is gathering information through research, questionnaires, and interviews, the DM-PM is responsible for keeping the rest of the PMT in the communication loop (USAF 1993). The user(s) need to identify their furniture requirements and other interior design items at this time. During this phase, the A/E and the DM-PM should ensure that all of these data are retained for the life of the project. There may be cases where this information is still needed by the Design-Build firm (Moritz 1994).

25. Requirements Analysis Charrette: This charrette is the final step before initiating schematic design. All relevant project data are displayed for all participants to review and correct, if necessary. Some of the products of the charrette are space projections and requirements, relationship diagrams, and an updated PCE (USAF

1993). One of the primary goals is to verify the scope and cost with the user before the project is submitted to Congress (USAF 1991).

26. Schematic Design Charrette: This charrette defines everything about the project that is important to the PMT. It is critical to note that after the PD phase is complete, the user and other members of the PMT will have little authority to change the design. The facility's aesthetic and functional requirements should be well detailed and coordinated. The PMT should also carefully consider important aspects of the building systems and site development (USAF 1993).

27. Produce PD Documents and Review: The PD documents will typically include schematics for the site plan, utility layout, architectural floor plan, and facility elevations; narratives on the major engineering systems, unique design features, environmental issues, operability and maintainability, and the link to the BCP; and the parametric cost estimate with price validation (USAF 1991). All members of the PMT will review the documents and prepare comments for the review meeting.

28. PD Review Meeting: The DM-PM chairs this meeting to ensure that all comments are addressed. The A/E is tasked to incorporate the comments, as appropriate, and prepare for the final submittal, the PD Briefing (Step 29).

29. PD Briefing: This briefing is prepared by the A/E for the Base Commander and senior level staff. The presentation is non-technical in nature, and may include presentation of renderings and models. Approval by the designated decision maker formally closes the charrette process (USAF 1993).

30. Forward PCE to Congress: The DD Form 1391 is modified to reflect the revised PCE, and is submitted to HQ AF via the automated Programming, Design, and Construction (PDC) computer system. HQ AF packages all revised 1391s into the Budget Estimate Submittal (BES), which is subject to congressional approval. These procedures will not apply for projects that already have construction funds allocated.

31. PD Phase Approved: The DM-PM issues formal approval of the PD documents to the Design Agent (USAF 1994).

32. Issue NTP for RFP Completion: The amount of work remaining at this stage depends upon the thoroughness of the PD documents. Examples of items that could remain include completing floor plans, elevations and sections, completing systems drawings, and converting the defined mechanical and electrical systems into drawing format. Additionally, the A/E may need to create performance specifications from the PD narrative system descriptions and complete a narrative description of the project (Smith 1994). The description should mention fast-tracking requirements if it is to be used. The specifications should reference only commercial standards. If government specifications cannot be eliminated, they should be included in their entirety within the RFP package (Moritz 1994). The Design Agent will prepare the "Front End," which contains the bid schedule, general and special provisions from the Federal Acquisition Regulation and supplements, and the evaluation criteria developed in Step 33.

33. Develop Evaluation Criteria for RFP: The key to a successful evaluation is to select criteria on which the offerors are likely to differ; such as proposed organization, management experience, and developing a beneficial project schedule (Edwards 1993). Often the most significant factor affecting the success of a project is the quality of the management team -- they must be cohesive and well organized. Therefore, the evaluation factors should reward proposers who demonstrate experience with the management, planning, design, construction, and operations of similar facilities (Potter and Sanvido 1994).

34. Appoint Evaluation Teams: It is helpful to have the teams identified and confirmed well before receiving proposals. The teams will generally fall into the following five categories (USACE 1993b):

- General Conformity -- Usually handled by the contract administrator to ensure that proposals contain the required information for unbiased evaluation.

- **Technical Evaluation Team --** Appointed if technical proposals are requested. The team will be staffed with architects and engineers representing each discipline. The Design Agent and the MAJCOMs will provide these personnel. Representatives from the BCE, user, and the A/E firm that prepared the RFP package may serve as advisors. This team is generally more applicable to Air Force Turn-Key projects, such as Family Housing developments.
- **Management Evaluation Team --** Members are as listed above, but must be different people so the identity of the proposers is not revealed to the technical evaluators.
- **Price Evaluation Team --** This team should consist of people from both the technical and management teams. The members must be familiar with the RFP requirements in their discipline.
- **Source Selection Evaluation Board --** This board reviews the evaluation results and forwards recommendations to the Source Selection Authority (SSA). The board is composed of more senior members than the other teams.

35. **Finalize RFP:** There is typically only one review during RFP preparation, at 90 percent. It is advisable to include an on-board review within two weeks of the NTP to ensure that the RFP package starts out correctly (Smith 1994).

36. **Corrected Final RFP Submittal and Approval:** The A/E incorporates all of the 90 percent review corrections and submits the RFP to the Design Agent. The Design Agent ensures that the project is Biddable, Constructable, and Operable (the "BCO process"), then briefs the SSA as an approval step. The SSA declares the project "Ready to Advertise" (RTA), and the RFP is formally approved (Smith 1994).

37. **Obtain Funds and Authority to Advertise:** If funds have not been previously allocated, this step is the Congressional approval of the project. HQ AF is authorizing advanced advertisement of Design-Build projects if they are RTA by 1 June of the previous fiscal year (Potter 1994b). This process can begin immediately after

submittal of the 90 percent RFP package. The authority to advertise is issued as a DI from HQ AF to the Design Agent, and the funds are transferred accordingly.

38. Issue Advance Notice: The advance notice should be issued in the Commerce Business Daily or mailed directly to potential bidders six to eight weeks ahead of RFP advertisement. This allows time for the potential proposers to form joint ventures and coordinate resources before the proposal preparation period (USACERL 1990).

39. Issue CBD Announcement: The announcement should be issued just before RFP completion if construction funds have already been appropriated. Otherwise, the announcement will follow the approval of project funding.

#### **4.5 Phase IV: Administer Request for Proposal**

The completion of Phase III marks the point in the project when it gets distributed to offerors. The tasks during this phase are depicted in Figure 10.

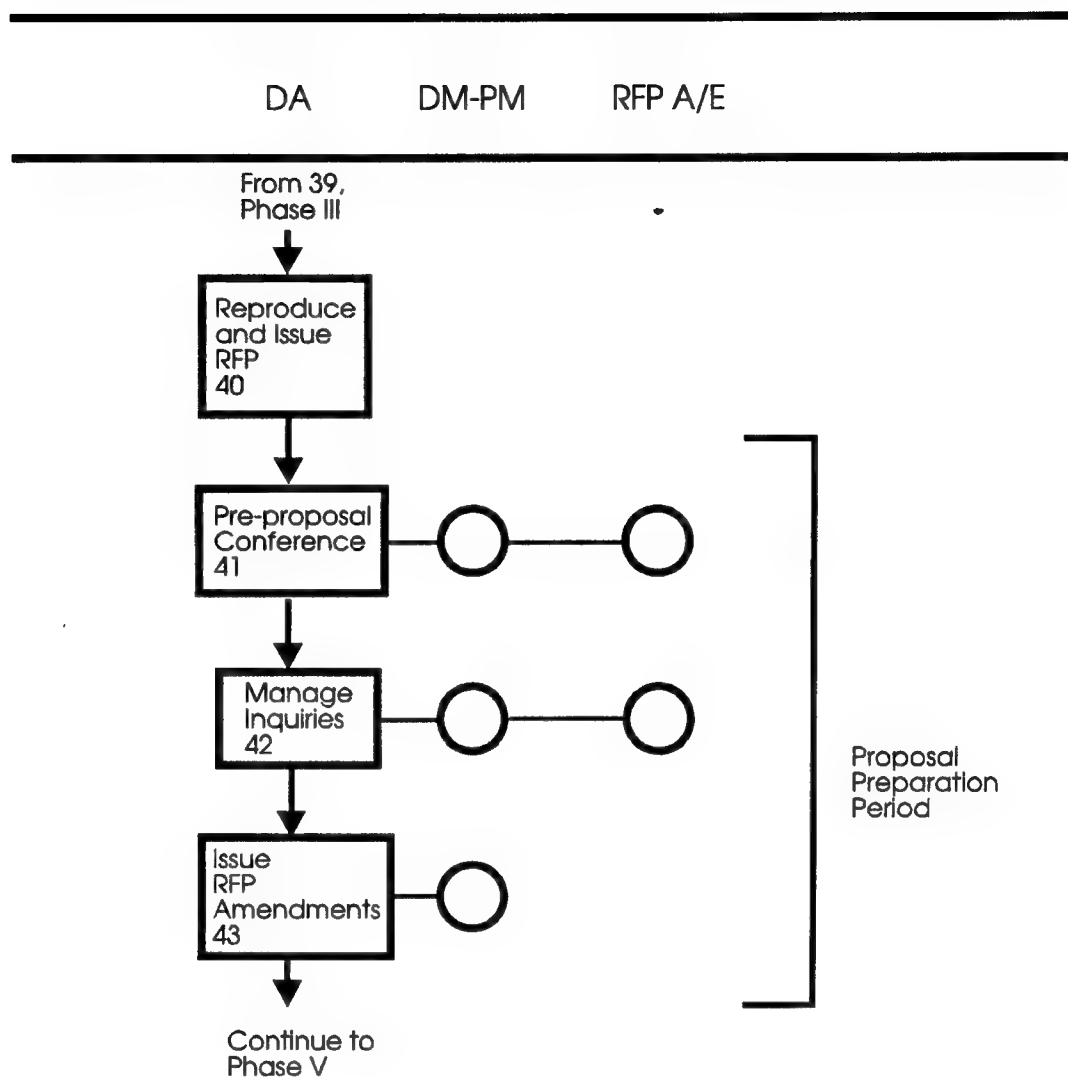
This phase is primarily handled by the Design Agent. The Air Force DM-PM should remain involved during the Proposal Preparation Period. The types of inquiries received and amendments required can give insight into potential problem areas for this and future projects.

##### **Key Team Members:**

*DA*: The Design Agent for the project, responsible for executing the contracts. On most Air Force projects, the US Army Corps of Engineers (USACE) fills this role. USACE representation includes the Major Subordinate Command and the District Program Manager.

*DM-PM*: The Air Force Project Manager responsible for executing the project from concept up to award of the Design-Build contract.

*RFP A/E*: The A/E firm responsible for preparation of the RFP.



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**Figure 10. Phase IV: Administer RFP**

40. **Reproduce and Issue RFP:** The number of RFP packages required for reproduction is based upon the initial response to the CBD announcement. The contract administrator will handle this function. The first day that the RFP is available is the start of the Proposal Preparation Period. This period will typically average 30-45 days.

41. **Pre-Proposal Conference:** This conference should be held within the first one-third of the proposal preparation period. The DA should request submittal of the proposer's questions before the meeting. Topics of discussion for the meeting include the Design-Build process and the project's technical and functional requirements (USACE 1993b). The DA may want to retain the RFP A/E for responses to technical questions during the conference and in the rest of the Proposal Preparation Period.

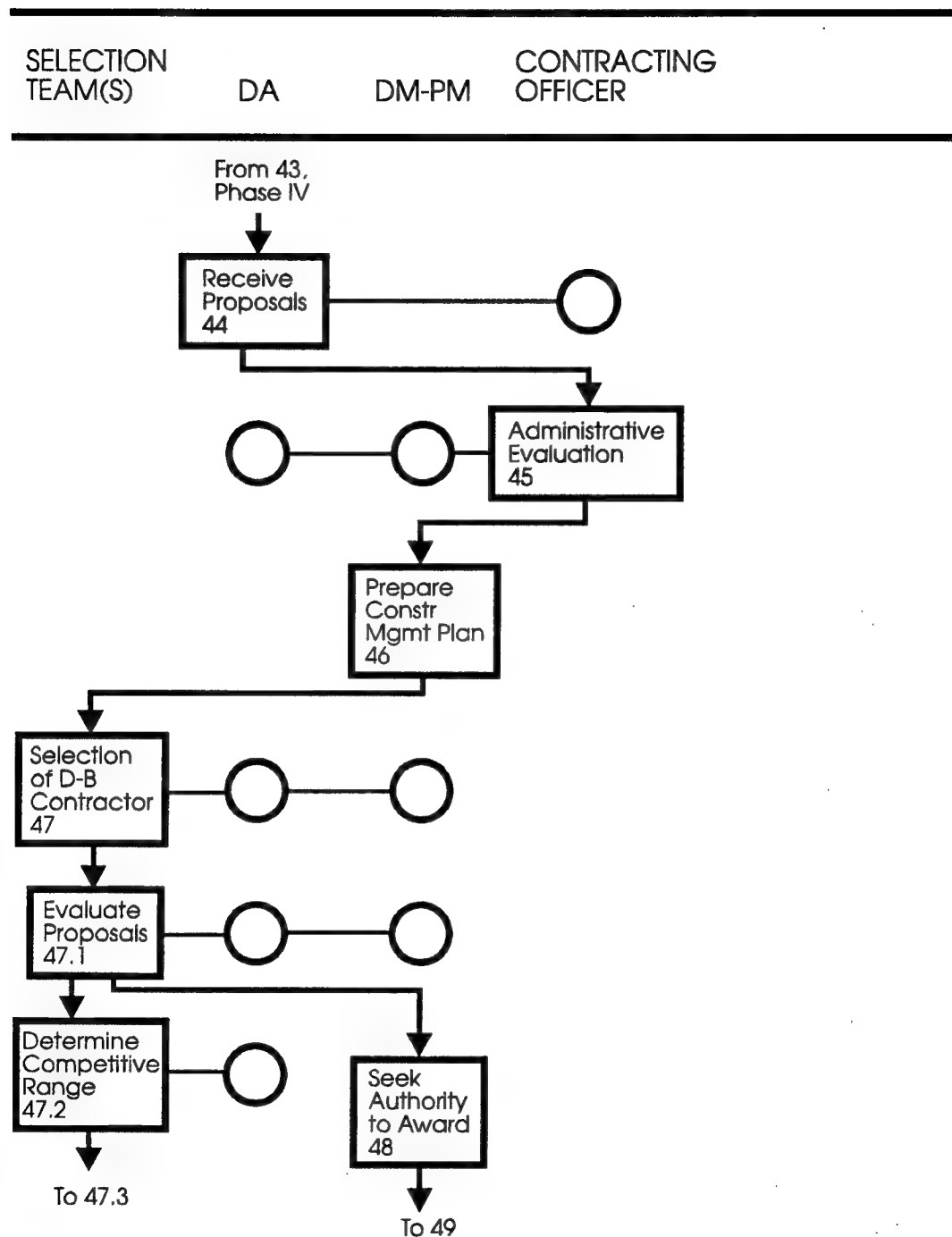
42. **Manage Inquiries:** All proposer inquiries should be directed to a single point of contact in the Design Agent's office. Inquiries are answered individually unless the issue is significant enough to require an addendum to the RFP (Step 43). Further clarification by the RFP A/E or other agencies should be controlled such that it is released in an unbiased manner (USACE 1993b).

43. **Issue RFP Amendments:** When an inquiry results in the discovery of an error or potential misunderstanding by the offerors, an amendment must be drafted and released to all holders of RFP packages (USACE 1993b). Some amendments may be significant enough to warrant extension of the Proposal Preparation Period.

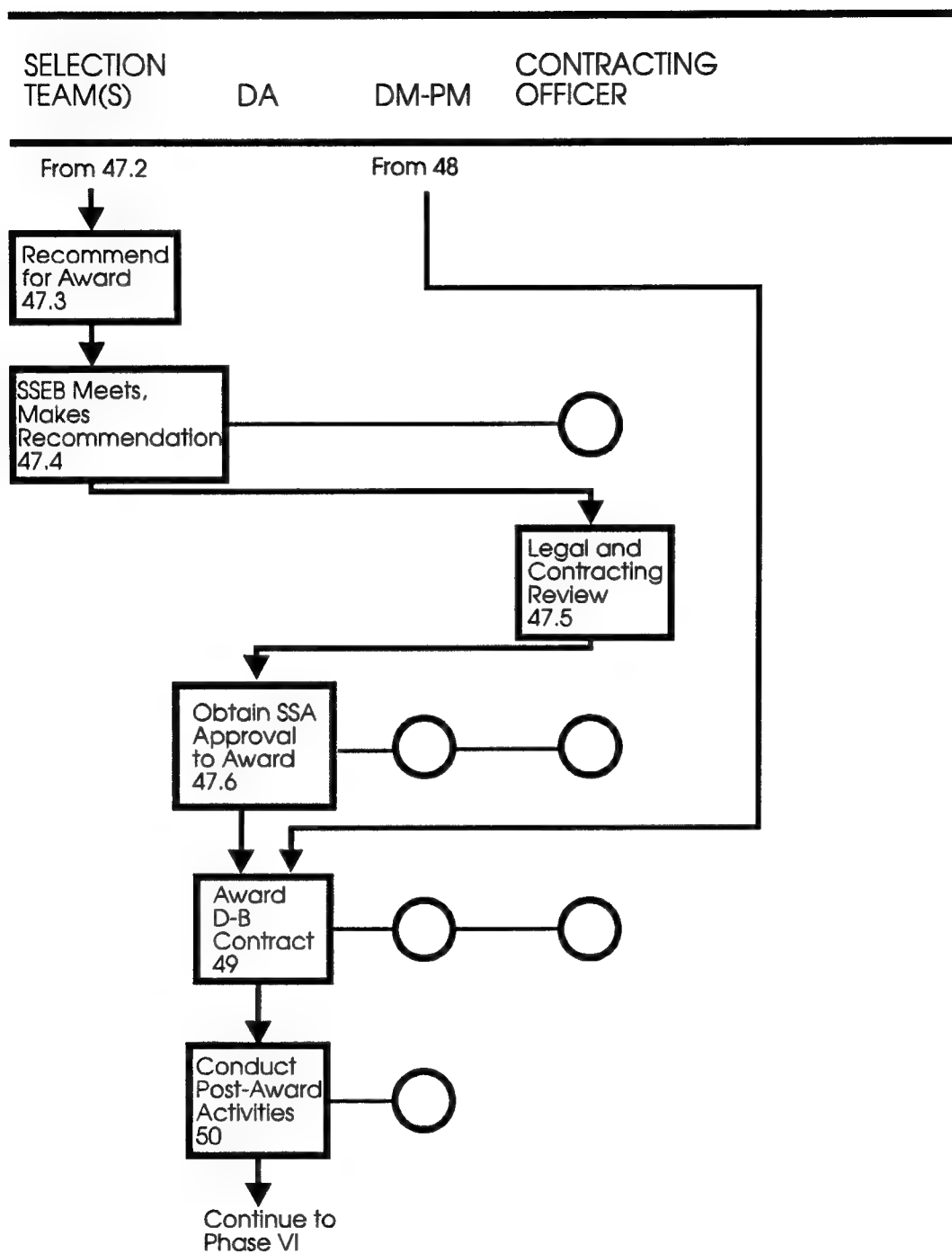
#### **4.6 Phase V: Proposal Evaluation and Award**

The transition point between Phases IV and V occurs at the receipt of the proposals, Step 44. At this point, all questions and concerns have been addressed and amendments issued. The Proposal Evaluation and Award Phase consists of eight major activities, which are shown in Figures 11 and 12.





**Figure 11. Phase V: Proposal Evaluation & Award, Page 1 of 2**

**Figure 12. Phase V: Proposal Evaluation & Award, Page 2 of 2**

The purpose of this phase is to select the Design-Build proposal which represents the best value to the Air Force. The Project Management Team should ensure that the members of the Selection Teams are not distracted by other duties during this evaluation period.

**Key Team Members:**

*Selection Teams:* May consist of one or more teams to review the following areas -- General Conformity, Technical Evaluation, Management Evaluation, Price Evaluation, Source Selection Evaluation Board (SSEB).

*DA:* The Design Agent for the project, responsible for executing the contracts. On most Air Force projects, the US Army Corps of Engineers (USACE) fills this role. USACE representation includes the Major Subordinate Command and the District Program Manager.

*DM-PM:* The Air Force Project Manager responsible for executing the project from concept up to award of the Design-Build contract.

*Contracting Officer (CO):* The Design Agent's contracting office. The District Contracting Officer often acts as the Source Selection Authority.

**Abbreviations:**

BAFO - Best and Final Offer

CR - Clarification Request

CWE - Current Working Estimate

DR - Deficiency Report

SSEB - Source Selection Evaluation Board

44. Receive Proposals: All proposals will normally be received by an administrative officer in the contracting office. The date and time of receipt are recorded.

45. Administrative Evaluation: This brief evaluation is performed to ensure that all material required by the RFP is included, and that the proposer's identity does not appear on the technical proposal. If deficiencies are discovered, the proposer is

usually notified and allowed to modify the proposal (USACE 1993b). The DA and DM-PM should ensure that the evaluation process is not delayed unnecessarily by these corrections. The purpose of the evaluation is to disqualify those proposals that are grossly deficient or would require major revision to meet the requirements of the RFP. The RFP may include a statement requiring proposers to keep their costs within the construction cost limitation for the project. Those proposals passing the evaluation are termed "responsive." Non-responsive proposals do not receive further consideration for the Design-Build contract.

46. Prepare Construction Management Plan: For large or complex projects, this plan identifies the decision-making authorities and describes the approval process for cost, schedule and quality control. Each agency involved in the construction phase should be identified, as well as listing management procedures, responsibilities, and coordination channels (USAF 1991). The plan is not directly related to Phase V, but is included here as a chronological reminder to the Air Force Design and/or Construction Project Managers.

47. Selection of Design-Build Contractor: Next to the preparation of the Project Definition package, this selection process can be considered the most critical point in the Design-Build project. The selection teams must use careful judgement to determine which proposal represents the overall best value to the Air Force. The selection process begins with a pre-evaluation meeting to review the CBD announcement and discuss the rules to be followed. The process is broken down into six major steps, 47.1 through 47.6, as follows:

47.1. Evaluate Proposals: Using the evaluation criteria developed in Step 33, the Selection Teams rate each proposal against the RFP requirements. The process used is not unique to Design-Build -- it is instead very similar to quality-based selection of A/E firms (Step 14). The ease and success of the process depends wholly upon the evaluation criteria used -- detailed requirements make the evaluation process less subjective and therefore less vague. Quality rating scores are determined for the management and/or

technical areas of each proposal. This is followed by a review of these scores to ensure consistency across all proposals. Most Air Force Design-Build projects will require only management and price submittals. The management submittal includes the offerer's approach to the project, which is the chance to demonstrate competency with the Design-Build process. The management submittal may also indicate the proposed usage of SBA/SDB firms in a subcontracting plan. At no time during these reviews will the proposals be compared with each other; this process is reserved for the Source Selection Evaluation Board.

47.2. Determine Competitive Range: The SSEB is the authority for determining the competitive range. All proposers in this range will have an opportunity to respond to Deficiency Reports (DR) and Clarification Requests (CR). The competitive range should eliminate proposals that do not stand a reasonable chance to be evaluated as the most favorable after receipt of this information (USACE 1993b). This determination is based upon factors other than contract price and is intended to lessen the workload on the evaluation teams and ease the financial burden on the proposers. Careful documentation and thorough justification must accompany any proposal that is eliminated at this point. Once responses to the CR/DRs are received, the proposers may be asked for their Best and Final Offer (BAFO). The BAFO, which is not a required step, can reflect an adjustment in any part of the proposal, including the contract price.

47.3. Recommend for Award: After the competitive range is determined and the BAFOs are received, the evaluations are revised for a final time. The final recommendation, based only upon Management and/or Technical information, is forwarded to the SSEB. The recommendation is in the form of a rank-ordered listing of the proposals in the competitive range.

47.4. SSEB Meets, Makes Recommendation: The SSEB combines the information from the Management and/or Technical evaluation with the Price

evaluation and determines which proposal represents the best value to the Air Force. The SSEB conducts discussions with the evaluation teams to clarify the relative value of each proposal. The SSEB recommendation is forwarded to the SSA for approval.

47.5. Legal and Contracting Review: Representatives from the DA's Legal and Contracting offices perform a final check of the selected proposal. Once the contract is awarded, the proposal will become part of the contract documents. A Business Clearance Memorandum is issued upon approval.

47.6. Obtain SSA Approval to Award: The Design Agent prepares a briefing for the SSA, who is normally the USACE's District Contracting Officer.

48. Seek Authority to Award: If all proposals are acceptable and an award is possible within the funding limitations, it may be possible to obtain advanced authority to award the contract. This "pre-positioning" of the project funds allows for an expedited seven day award process once the contractor is selected. Otherwise, this authority should be obtained after the successful proposer is selected (USACE 1993b).

49. Award Design-Build Contract: Barring any complications, the contract is awarded according to standard procedures. If the contract amount is greater than \$3 million, Congress must be notified of the intent to award. The notification period lasts three days (Smith 1994).

50. Conduct Post-Award Activities: The Design Agent places a notice of contract award in the Commerce Business Daily and the DM-PM updates the PDC system. If requested, unsuccessful proposers are entitled to a debriefing on selection decisions. Debriefings are intended to be constructive and mutually beneficial, so the DA and DM-PM should use this process to solicit meaningful feedback. They must be careful, however, not to make any comparisons between proposals (USACE 1993b).

#### **4.7 Phase VI: Design/Construction**

With the award complete, the project moves into the final phase of the Design-Build process. While considerable time and effort have been expended in the previous five phases, Phase VI is where most of the "visible" activities take place. Figures 13 and 14 depict the key steps during this process. The speed of this phase will vary with each project, but the process will be similar in all instances.

The final phase of a Design-Build project can become very complicated, with many simultaneous activities. One of the beneficial features of Design-Build is that it allows for fast-tracking, or simultaneous design and construction. The fast-tracking decision should be made early in the project planning stages, not after contract award. The key to successful fast-tracking is to separate the project into design/construction packages. Each package should be completely designed and approved before construction starts on that portion of the work.

Fast-tracking should be reserved for projects with a bona-fide need, as its use increases the potential for design errors, coordination problems, and legal entanglements. Whether or not fast-tracking is used, the quicker pace of a Design-Build project will require a larger on-site staff for the Construction Agent.

##### **Key Team Members:**

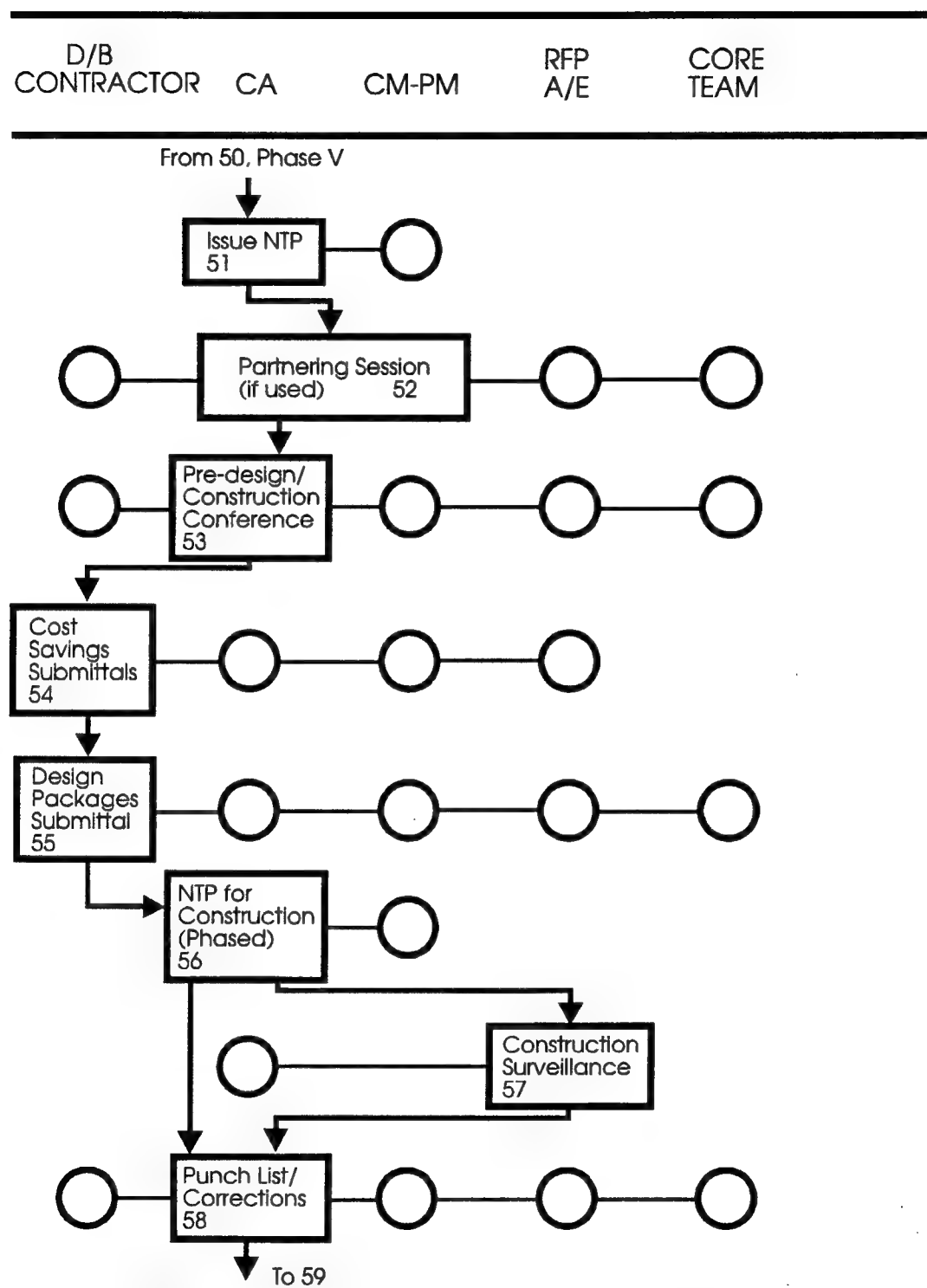
*D-B Contractor:* The entity that will complete design and construction of the facility.

*CA:* The Construction Agent for the project, responsible for executing the contracts. On most Air Force projects, the US Army Corps of Engineers (USACE) fills this role. USACE representation includes the Major Subordinate Command and the District Program Manager.

*CM-PM:* The Air Force Project Manager responsible for executing the project from award of the Design-Build contract through contract close-out.

*RFP A/E:* The A/E firm responsible for preparing the RFP documents. The firm may be retained for services including inspection, review, and advising.

*Core Team:* Contracting Officer, BCE Project Manager, Using Agency.



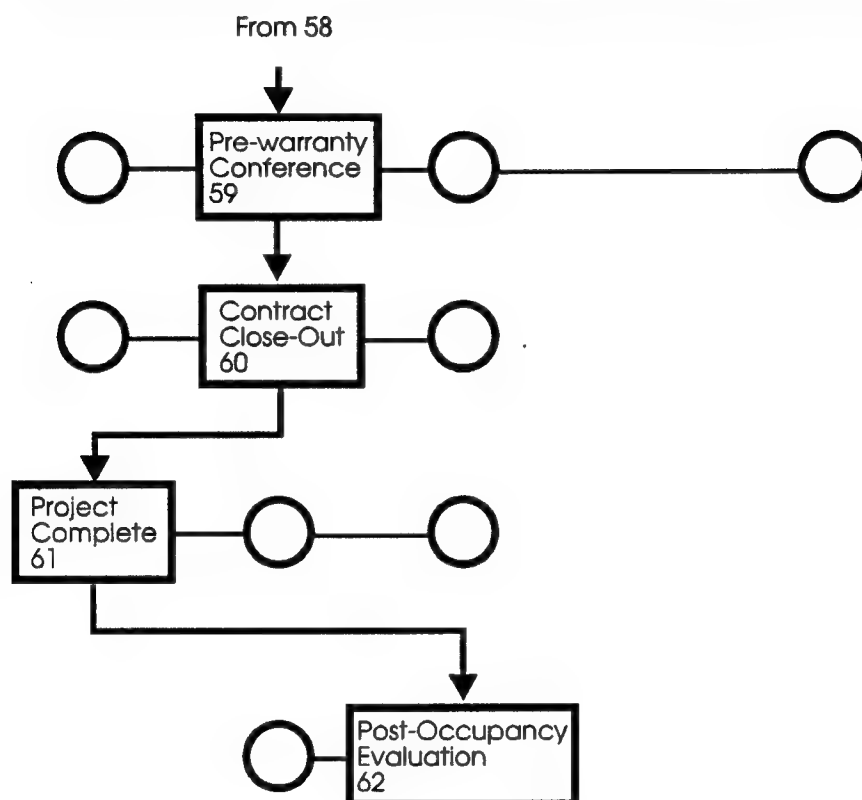
**Figure 13. Phase VI: Design/Construction, Page 1 of 2**



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D/B CONTRACTOR	CA	CM-PM	RFP A/E	CORE TEAM
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**Figure 14. Phase VI: Design/Construction, Page 2 of 2**

51. Issue Notice to Proceed: Soon after contract award, the Construction Agent issues the formal NTP. This initial NTP normally limits the contractor to design activities only. To protect the government against unsatisfactory design performance, a termination clause is often included in the contract. This clause allows the Air Force to pay the contractor a percentage fee at completion of design and terminate the contract before any construction is started.

52. Partnering Session (if used): Partnering during the construction portion of MILCON projects is gaining popularity in the Air Force. The partnering session will utilize an experienced facilitator to establish mutual goals and objectives for the project. Areas of focus for the partnering effort can include exceeding quality goals, avoiding litigation, meeting budgets, exceeding safety standards, and meeting the project schedule (USAF 1994).

53. Pre-Design/Construction Conference: The main purpose of the conference is to cover local ground rules at the job site and to ensure that all members of the PMT understand their responsibilities during this phase. If fast-tracking is not being used, there will be a separate Pre-Construction Conference after Step 55. The Design-Build contractor needs to clear up all design and construction issues to ensure that the project schedule is maintained. Additional items for review include the provisions for design approval, Value Engineering, and modification requests (USACE 1993b). The PM must keep a close watch on the contingency accounts and ensure that the user is not left out of the modification process (USAF 1991).

54. Cost Savings Submittals & Review: All cost savings proposals should be submitted within 30 days of the NTP. Prompt attention to these proposals by the Construction Agent and the CM-PM will ensure that all parties benefit from the process.

55. Design Packages Submittal & Review: A typical fast-track submittal schedule would separate the project into two packages: Package I will include the site

work, exterior utilities, and foundations. Package II will encompass the remainder of the project. On critical fast-track projects, a preliminary foundation submittal may be called for. If fast-tracking is not used, the contract documents may call for 60 percent and 90 percent design submittals. In any case, the review requirements for each submittal can be very burdensome. Up to four meetings may be required: On-board at the firm's office, government-only, all personnel, and a back check (Moritz 1994). The RFP A/E is typically retained to review these submittals. This time period is also used to secure final environmental permits before construction starts.

56. NTP for Construction (Phased): The CA will issue a NTP for each phase of a fast-track project. This formality ensures that construction does not out-pace design. For a project that is not on a fast-track schedule, there may be only one NTP after the design is completed.

57. Construction Surveillance: The responsibility for construction surveillance falls with the Construction Agent in most cases. The process map illustrates a case where the RFP A/E has been retained for this purpose.

58. Punch List/Corrections: When the project is considered complete, the CA conducts the pre-final inspection and generates the project punch list. Other project requirements such as operational and performance testing should also be complete. Once these items are corrected and/or resolved, the final inspection is conducted (USAF 1994).

59. Pre-Warranty Conference: This conference is held prior to the final inspection to discuss warranty procedures. The contractor is responsible for providing a point of contact in the local service area for warranty issues (USAF 1994).

60. Contract Close-Out: The close-out process is initiated with the final inspection. The CA submits the real property transfer document (DD Form 1354) to the CM-PM within 30 days of the final inspection. Financial records should be closed within six months of facility acceptance (USAF 1994).

61. Project Complete: The Design-Build contractor has completed the project requirements when the facility is accepted by the host base. The Beneficial Occupancy Date indicates the point at which the using agency can start moving into the facility. In some cases, the facility may be partially occupied before construction is complete (USAF 1994).

62. Post-Occupancy Evaluation: The PM should lead the effort to evaluate the facility at four and nine months after construction completion (USAF 1994). The CA takes part in the evaluation, and will initiate the request for warranty work with the warranty contractor. User comments are critical so problems with the design or layout of the facility can be noted for future projects (USAF 1991).

## **CHAPTER 5**

### **DESIGN-BUILD PROCESS ANALYSIS**

#### **5.1 Introduction**

The Design-Build Process Map of Chapter Four details management steps that are a key part of almost any Air Force MILCON project. Upon closer analysis, Phases Two, Four, and Six are nearly identical to the processes used on conventional Design-Bid-Build projects. The other phases contain steps that have a more direct effect on the success or failure of a Design-Build project.

As outlined in Chapter Three, and as a means of extracting valuable experience from senior leadership at AFCEE, a series of questions were asked regarding these three critical phases of Design-Build construction: Planning, Developing the RFP, and Proposal Evaluation and Award. The interviews are summarized below in the logical sequence of the Design-Build Process Map. The specific questionnaires are included in Appendix B.

#### **5.2 Phase I: Planning**

One reason for choosing Design-Build is a demand for faster project completion. Considerable time savings can be achieved by using fast-track construction procedures, which fit well with Design-Build. Fast-tracking, however, is not the only means of compressing the project timeline. The fastest Design-Build method uses the Turnkey concept combined with a two-step selection procedure. AFCEE has successfully used this "lowest price technically acceptable" selection procedure on a War Reserve Material Warehouse at Mountain Home AFB, Idaho. The project time span was nine months from concept to completion -- a true record-setter. The primary time savings in this process comes from the lack of a detailed Project Definition package and forgoing a lengthy Source Selection process. Instead, proposers are

screened on management qualifications, then allowed to submit bids on a performance specification-driven proposal package. The US Navy's Newport Design-Build system uses the two-step procedures for straight-forward facilities like dormitories, warehouses, and fuel tanks (Spaulding 1988). There could be a trade-off between less user involvement in the design and the potential for low-bid cost savings, but the time savings can be substantial.

Perhaps more significant than time savings is the potential for cost savings. AFCEE has consistently experienced smaller cost and time growth on Design-Build jobs than on conventional projects. Even with this cost growth advantage, it has never been shown that Design-Build projects are truly more cost-effective than Design-Bid-Build jobs. There is interest in AFCEE in performing a study to analyze the relative costs of the two methods.

In determining the appropriateness of Design-Build, the Project Management Team should consider the timely availability of construction funding for the job, as the MILCON approval cycle is structured to fit a Design-Bid-Build project. A conventional MILCON project and a Design-Build project are fairly similar up to the point of completing the Project Definition package. At that point, the conventional project needs approval to continue design funding and the Design-Build project needs construction funding. Since this approval point is 12 months prior to appropriation of construction funds, the Design-Build project must be put on hold for up to one year. For this reason, there is no time advantage to starting a Design-Build project under the typical MILCON approval constraints.

There are three primary sources for early availability of construction funds: projects associated with Base Realignment and Closure (BRAC), late Congressional inserts, and emergency repair or replacement jobs. BRAC projects are typically tied to a critical need date and the closure of a military facility, so construction funding is available from the point of project authorization. BRAC projects, Congressional inserts, and other "late" projects all have one thing in common -- the front end of a five-year MILCON cycle has been eliminated. BRAC projects will be a significant portion of the MILCON program in years to come, so there is plenty of opportunity for usage of Design-Build. The US Navy, in planning for the latest round of base closures, solicited 14 separate indefinite requirements (IDR) contracts with A/E firms

for the preparation of RFP packages. This allowed them to hire experts in separate specialties (aircraft beddown, medical, dining halls, etc.), eliminate the need to continually define parameters for new A/E firms, and avoid the time delays of CBD announcements and A/E selection procedures.

Once the funding picture is clear, the PMT needs to determine if the project fits well with the constraints of Design-Build. The mind-set in the past has been that Design-Build projects need to be new facilities that are comparable to private sector requirements. AFCEE experience has shown that it can also work well with fairly complex jobs. Examples include the Composite Maintenance Hangar at Whiteman AFB, the Cryptologic Support Facility at Kelly AFB, and the Avionics Facility at Tinker AFB. The decision boils down to one factor: the ability of the PMT and the RFP A/E to define all of the critical requirements in an RFP package. The owner and user must be able to define their requirements early, yet maintain an open mind to possible design solutions by the Design-Build team. There is a feeling that renovation projects may not be appropriate because this required level of design definition may be comparable to a complete design. The concept may work well with a dormitory renovation, however, where the structure is gutted and completely re-designed. Air Force medical projects are another area that have not seen much use of Design-Build for similar reasons.

Once the PMT feels that the project scope may be appropriate for Design-Build, several more questions must be addressed. The team may want to consider the Turnkey approach for projects that can be defined well with performance specifications, are of a large scope (over \$10 million) and where competitive design solutions are sought. Although the Air Force has usually used the competitive design approach only on housing projects, it has been used by the other military services for Child Development Centers and Commissaries. One drawback to this approach is that the competitive designs can turn into "beauty contests," whereby the technical details of the proposals become secondary to the architectural presentation. In addition, this approach is costly for the proposers, thereby limiting competition. Recent guidance from HQ AF/CE allows using fixed stipends to reimburse some of these costs (Wolff 1994). The MAJCOMs may be reluctant to use these stipends, however, in today's environment of shrinking design funding. The unfortunate reality is that many

MAJCOMs are choosing Design-Build or Turnkey simply because they do not have adequate design funds for the conventional method.

Another key decision for the PMT lies in predicting the market responsiveness to a Design-Build or Turnkey solicitation. A market survey should be performed to gain an understanding of local and/or national economic factors and contractor familiarity with these delivery methods. The PMT should consult with local trade associations such as the Associated General Contractors as well as the servicing USACE district for help in this evaluation. It may be difficult to predict economic trends several years into the future, and these can play a big role in the market's response. AFCEE has experienced unsatisfactory responses to Turnkey solicitations within the last year due primarily to a saturated construction market.

Once all of the above factors are weighed, the PMT can make an informed decision on the use of Design-Build. Next, the decision on design and construction partnering should be made. Partnering is not used as often during the Project Definition phase as it is in construction. The use of the charrette process accomplishes much of the goals of partnering, but it should still be considered for projects involving multiple users or several A/E firms. The USACE's Louisville District has taken the lead on implementing partnering during the design phase. Although the Air Force has no formal partnering goals or policies, Air Force Space Command has issued a directive to use it on all projects. AFCEE experience shows that the costs of partnering are relatively minor (\$10 to 25 thousand) compared to the benefits received. AFCEE's Family Housing Division will consider partnering as standard procedure beginning with FY 96.

A final contract execution decision in the Project Management Plan is a determination of applicability for Small Disadvantaged Businesses (SDB). According to the Federal Acquisition Regulation, Part 6.401, the Contracting Officer is obligated to set aside a project for SDB if three conditions can be met (USACE 1993b):

1. The CO believes that more than two bids (proposals) will be submitted from responsible businesses.
2. An award will not exceed the "fair market price" by more than ten percent.
3. Scientific and/or technical talents consistent with the demands of the project will be obtained through use of SDB set-aside.



AFCEE experience with SDB set-asides has been entirely negative on several projects, and they do not recommend that it be used for Design-Build. SDB goals can still be met by requiring their utilization in the subcontracting plan. The subcontracting plan can be identified as an evaluation factor in the RFP package, and points can be awarded for greater usage of SDB firms.

### **5.3 Phase III: Develop the RFP**

When Design-Build was just starting to be used on Air Force projects, there were consistent complaints about the increased administrative workload on all parties (Engineering-Science 1991). Much of the negative reaction came from the Corps of Engineers, who were being forced to substitute commercial specifications in place of their standard Corps guide specifications. Now that the idea has been in use for a few years, project managers generally agree that the overall workload is the same as on a conventional project, but it can be compressed into a shorter time frame. The Project Definition process is being used on all MILCON projects, so the primary difference in administrative workload will come from creating and reviewing performance specifications and any overlap of design and construction. The PMT may consider packaging several projects together to eliminate duplicative effort in the RFP stage.

Most Air Force Design-Build projects have used A/E firms, rather than the Corps of Engineers staff, for the preparation of the Project Definition package. This is primarily because the A/E firms have a higher level of expertise and can dedicate a team of people to the project. There are cases, however, when it is to the advantage of the Air Force to utilize USACE personnel. AFCEE is using a combination of A/E firms and USACE designers on the \$76 million package of projects at Homestead Air Reserve Base. The Corps team is designing a portion of the infrastructure that is not on a critical time schedule. When the other traditional and Design-Build projects start rolling in for review, this dedicated team is already familiar with the base and can review these other projects with greater efficiency.

Although it will vary by project, the primary difference between PD packages for conventional versus Design-Build projects relates to the Comprehensive Interior Design (CID). Many of these specific requirements for furniture, hardware, light fixtures, etc., may need final detail in a much shorter time frame than normally

allowed. Interior colors and finishes must also be finalized, as this stage is the last point of major influence for the user. Certain design elements may need extensive (60-100 percent) definition in the Design-Build PD package. Examples of this include the specific requirements for a secure conference room and the design of an office communications system. If a requirement in an Air Force regulation cannot be converted to a performance specification, it may be possible to complete the design for that element instead of including the regulation in the RFP.

#### **5.4 Phase V: Evaluation and Award**

There is one word in this phase that often worries a contracting officer: Protest. The contractor selection process in the federal government must be very meticulous and conservative to prevent a protest from delaying the project. It is for this reason that the determination of the competitive range is often a step that is overlooked. For projects that have only three or four proposers, the competitive range step is not that important. On the other hand, as was the case on the Sparkman Center project, the failure to narrow down the list of proposers on a job that requires technical submittals can be disastrous (Potter and Sanvido 1994). The lesson learned here is that the PMT should not feel "handcuffed" by the requirements of the Federal Acquisition Regulation -- instead the team should use the requirements to the advantage of the Air Force. By developing very strict evaluation criteria, the PMT has the option of either enforcing the criteria in the case of many proposers, or forgoing a strict evaluation if there are only a few responses.

If the projected market response to a Design-Build solicitation is strong, the PMT can use a modified Request for Proposal process. The modified process uses a Request for Qualifications (RFQ) as the initial step, before the Project Definition documents are complete. The RFQ seeks information only about the composition and experience levels of the Design-Build entities. This information is similar to that requested in the RFP management proposal.

## **CHAPTER 6**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1 Conclusions**

Design-Build is a method of project execution that can be applied to almost any Air Force MILCON project. Although the procedures may be relatively new to the Air Force, the method has been used in the private sector for many years. Forthcoming Air Force guidance on the use of Design-Build and Turnkey does not establish a minimum dollar limit for using either method. AFCEE recommendations are a minimum Programmed Amount of \$2 million for Design-Build and \$10 million for Turnkey.

The recommended process for using Design-Build, as detailed in this thesis, is fairly straight-forward and does not deviate significantly from standard MILCON and Source Selection procedures. The Design-Build process can be considered a modified MILCON Project Definition package with a source selection tacked on the end. Major differences occur in the critical nature of defining all user requirements in the Project Definition and in the necessity to develop performance specifications for the RFP. Because the process can often involve time compression, it is more critical for the Project Management Team to have Design-Build experience.

Design-Build usage in the Air Force will continue to grow as word spreads of its benefits. Project managers must be cautioned to abide by the Federal Acquisition Regulation in determining applicability. They should also resist using Design-Build simply as a method of saving up-front design money. As the market share of Design-Build in the US continues to grow, increased competition will allow the concept to be used on a wider economic range of projects.

## **6.2 Recommendations**

There are many questions that remain to be answered about the applicability of Design-Build, and therefore there is a need for further study in this area. The studies that have been performed to date have used qualitative judgments in the areas of cost and schedule as an endorsement of the method. See Experiences of Federal Agencies with the Design-Build Approach to Construction (FCC 1993) for an example of such a study. The current mind-set in the Air Force is that Design-Build is only applicable to projects that have out-of-cycle access to construction funding, such as BRAC jobs. There are other benefits of Design-Build, however, beyond time savings. It is possible that the reduction of change orders, cost growth, and claims may be significant enough to justify its use on all projects. These individual items are difficult to quantify without a careful analysis. Further study of federal Design-Build projects could also help in establishing guidance for a cost range of applicability. NASA had seven responses to a \$700 thousand Turnkey project (FCC 1993) -- can the Air Force expect similar responses at that funding level?

One particular item of interest to the author is the propensity of Contracting Officers and MAJCOMs to select the lowest-priced proposal. There are varying opinions on how often this is done -- some say it is about 50 percent, others say it is "most of the time." If this is indeed true, it is good justification for using two-step selection procedures. The recent procurement reform bill should also help in this area. The Air Force had great success with this method at Mountain Home AFB, but it has seen little utilization since then. While this method is typically associated with "simple" facilities, the author believes that it should receive wider consideration. As long as the PMT ensures thorough preparation of the Request for Qualifications, the two-step process should work on more complex facilities. The author recommends application of the two-step concept in markets that have an established presence of Design-Build contracting experience.

The knowledge base of Design-Build experience in the Department of Defense is located in "pockets" and is not easily accessible. Individual USACE districts are developing their own slightly different methodologies, the Navy is experimenting with two-step procedures, and AFCEE is gaining vast experience with housing applications. The entire engineering community in the DOD would benefit from an annual

conference on Design-Build projects. The Navy's Newport system, the development of a standard RFP for medical facilities, and the use of Turnkey procedures for Child Development Centers are examples of lessons learned that are bound to have applications throughout the DOD. The Air Force MAJCOMs, subject to greater personnel turnover than AFCEE, would benefit from additional Air Force-wide or in-house training programs. At a minimum, the Air Force Institute of Technology should incorporate Design-Build lessons into its continuing education program.

The Air Force's Source Selection procedures, governed by Air Force Regulation 70-30, are restrictive in nature and not conducive to efficient, speedy selection of design and construction contractors. The regulations apply to source selection of everything from a pencil supplier to a major weapons system, so the restrictions are understandable (Leehy 1994). In the current era of "Reinventing Government," the simplification of AFR 70-30 would greatly enhance Design-Build procurement.

## **APPENDIX A: LIST OF ABBREVIATIONS**

A/E - The Architecture and Engineering Firm  
AFB - Air Force Base  
AFCC - Air Force Communications Command  
AFCEE - Air Force Center for Environmental Excellence  
AFIT - Air Force Institute of Technology  
AFM - Air Force Manual  
AFR - Air Force Regulation  
AFSOC - Air Force Special Operations Command  
AFSPC - Air Force Space Command  
BAFO - Best and Final Offer  
BCO - Biddability, Constructability, Operability  
BCP - Base Comprehensive Plan  
BES - Budget Estimate Submittal  
BRAC - Base Realignment and Closure Commission  
CBD - Commerce Business Daily  
CCL - Construction Cost Limit  
CDC - Child Development Center  
CID - Comprehensive Interior Design  
COE - The US Army Corps of Engineers  
CR - Clarification Request  
CRC - Criteria Review Conference  
CTL - Construction Technical Letter  
CWE - Current Working Estimate  
D/B - Design-Build  
DA - Design Agent  
DBB - Design-Bid-Build  
DCAA - Defense Contracting Audit Agency  
DeCA - The Defense Commissary Agency

DI - Design Instruction  
DOD - Department of Defense  
DR - Deficiency Report  
HCP - Housing Community Plan  
HL - Hired Labor, the term used for the DA's in-house personnel  
IAW - In Accordance With  
IDIQ - Indefinite Delivery, Indefinite Quantity  
IDR - Indefinite Requirements  
IFB - Invitation for Bids  
IRP - Installation Restoration Program  
MAJCOM - An Air Force Major Command  
MILCON - Military Construction Program  
MOU - Memorandum of Understanding  
NAVFAC - Naval Facilities Engineering Command  
NTP - Notice to Proceed  
O&M - Operations and Maintenance  
OSD - Office of the Secretary of Defense  
PA - Programmed Amount  
PCE - Parametric Cost Estimate  
PDC - Programming, Design, and Construction -- the Air Force MILCON project  
computer database  
PI - Planning Instruction  
PMP - Project Management Plan  
PMT - Project Management Team  
RAMP - Requirements and Management Plan  
RD - Requirements Document  
RFP - Request for Proposal  
RFQ - Request for Qualifications  
RMC - Requiring Air Force Major Command (MAJCOM)  
RTA - Ready to Advertise  
S&A - Supervision and Administration  
SAF - The Secretary of the Air Force

**SB - Small Business**  
**SCIF - Secure Compartmented Industrial Facility**  
**SDB - Small Disadvantaged Business**  
**SF - Square Feet**  
**SIOH - Supervision, Inspection, and Overhead**  
**SouthDiv - The Southern Division of NAVFAC**  
**SOW - Statement of Work**  
**SSA - Source Selection Authority**  
**SSEB - Source Selection Evaluation Board**  
**TK - TurnKey**  
**TOA - Total Obligation Authority**  
**USACE - The US Army Corps of Engineers**  
**USAF - The US Air Force**  
**VECP - Value Engineering Change Proposal**  
**WRM - War Reserve Material**  
**WWTP - Waste Water Treatment Plant**



## **APPENDIX B: INTERVIEW SUMMARIES**

### **Interview Summary: Capt. Patrick Smith, 27 Jul 94, 29 Jul 94**

Review of process map developed by the USACE Louisville District (USACE 1993a)

Starting point for the D/B process is at the RMC DI -- this begins the RAMP, IAW the Level 2 MOU between the AF and USACE

- The RAMP indicates the approach to be used, PM starts working project at this point
- RAMP is prepared at the base, PM at headquarters prepares the PMP, makes the decision on whether or not to use D/B
  - MAJCOM requests authority from SAF/MII; this authority is currently being delegated to the MAJCOMs
  - At Homestead, they obtained verbal approval from SAF/MII, then followed up with a formal request (letter)

#### **"ASM Process"**

- A/E selection and IDIQ contracts -- there are new limits for IDIQ contracts, approved within the last 6 months; the old limits were \$75K per DO and \$200K per year, new limits are \$299K per DO and \$750K per year
- It takes a long time to go through the A/E selection process, so AFCEE is trying to set up several IDIQ contracts

#### **"A/E Selection Process"**

- Breakdown of design funds is as follows: Title I (A and B) covers design, Title II covers construction management, inspection, review of drawings. Within Title I, Type A covers studies, travel, supplies and misc. costs, while Type B covers the preparation of design drawings, specs. and etc.
- Homestead's basic contract was for PD preparation, used contract options for completing the RFP and Title II services
- RFP preparation will average 2.5% to 4% of the programmed amount
- Predefinition Conference is also called the Criteria Review Conference

#### **"Preparation of RFP"**

- D/B charrette process is very similar to standard charrette process
  - Data Gathering, Requirements Analysis, Schematic Design, PD Briefing, PD Review Meeting, RFP Preparation

-- Uniqueness is that the PD must match the way the RFP is structured so a re-write is not required; includes equipment matrices for electrical and mechanical requirements, layout of equipment, may included a CID

--- The A/E is tasked to develop the CID in 30-45 days, which is much faster than normal

- 2 weeks after giving go-ahead for RFP completion, Homestead projects had an on-board meeting with the A/E

-- Primarily developing specifications at this point, want to prevent back-tracking, some sections will be deleted

- After PD is complete, completing the RFP entails developing specifications, revised/completed floor plans, elevations and sections, systems drawings, special details, and a design narrative

- Completion goal is usually September to get Congressional approval

-- Either 35% designed or an "executable" project; approved site, definable scope, parametric cost estimate

-- Can get approval with a RAMP and a TRACES cost estimate

- The actual RFP approval is independent of Congress, they only see the PCE

- RFP is developed during Congressional debates

#### "Advertisement"

- Steps are: SSA briefing (approve RFP); Obtain funds and authority to advertise; Issue CBD announcement; Mail advance notice; Reproduce RFP; Issue RFP

#### "Design"

- Timeline can vary from 5 weeks to 5 months, some will have simultaneous design and construction

- For Homestead projects, design and construction milestones were identified in the RFP, contractor then submits detailed schedule

-- Whiteman projects used a detailed schedule in the RFP, found that it was difficult to follow

- Only 1 NTP issued for Homestead projects

-- Construction start depends upon design package approval

- Homestead projects use a Resident Construction Manager, per the Blue Book

**Interview Summary: Mr. Bill Moritz, 1 Aug 94**

Mr. Moritz provided me with a milestone schedule from the D/B projects at Whiteman AFB, and this was reviewed briefly. The projects were 2 aircraft hangars and a composite maintenance facility, for a total of \$25 million.

- The projects were designed to the PD level with the traditional approach, then the decision was made to use D/B; the specifications had to be re-done at that point
- They had a kick-off meeting to determine what was required for the conversion
- This schedule was fairly compressed

General review of Design-Build and preliminary process map

- Need to show more overlap of steps in my schedule
- The preparation of the RFP is similar to the conventional process; the proposal phase is where the differences start -- like the source selection
  - Differences in the source selection process -- more panels for evaluation, extent of submittal required from the contractor
    - Contractor must do some level of design to develop the cost proposal; government should keep the submittal requirements to a minimum in order to generate interest in the project
  - The source selection process is an evaluation of the "promise to perform"
- Move 2807 notification to before D/B decision is made
- The PD and RFP phases should not be separated
  - The front-end contains the contract clauses, explains the D/B process, statement of work, special provisions, evaluation criteria
    - Need to move development of evaluation criteria up earlier
- Need a letter from the MAJCOM to initiate the RAMP
- User input is critical to RAMP; can be voluminous and these references may be needed by the D/B design firm also, so keep copies for this purpose
- If the PD is developed with D/B intended, then there should not be much more to do to finish the RFP
- What level of design is required to advertise? Used to think that 35% necessary, now know that some areas will require further definition -- electrical, mechanical, plumbing floor plans -- need to define the systems and any special requirements
- Need to delete references to AF/USACE/DOD manuals or regulations because proposers do not have access to these and do not have the time to digest the information while preparing a proposal; otherwise need to copy and provide these in the RFP
- Add partnering to flow chart

- Contractor submittals and shop drawings were all before construction was approved
- Role of project manager does not differ from that described in the Blue Book

**Specific Questions:**

**What projects are appropriate for D/B?**

- Need to have construction funds available when you are ready for them; a project on the standard MILCON cycle will actually lose time with the D/B process since authority to design is a year in advance of authority to construct
- Base closure projects have one pot of money for everything -- O&M, design, construction, MILCON, etc.
- Whiteman projects had problems getting money to complete the designs; this is why D/B was chosen

**What factors are predominant for why D/B is selected?**

- No proof that design dollars are being saved
- Ability to choose best contractor is important
- Adversarial relationships are avoided through partnering, not necessarily unique to D/B
- Minimization of cost growth and construction time growth

**Can SB/SDB goals be met with D/B projects?**

- Put the requirement for subcontracting in the RFP
- Whiteman projects were too big to consider for award of entire contract

**What type of specification should be developed for the RFP?**

- Using performance specifications, should be able to get a good product cheaper
  - Gain the value of the contractor's experience

**What is your opinion of the 2-step source selection process?**

- Whiteman projects used 1-step, cost alongside the other factors
- Selection of lowest bid from a qualified group -- most likely to only get qualified contractors submitting on a \$25 million job, so taking low bid is not much different than IFB process

**What is your opinion of the administrative workload of D/B projects?**

- Was intense during design because of 4 review meetings for each design submittal; the project also was broken into 3 separate design packages that were occurring simultaneously
  - 4 review meetings: On-board meeting to check progress; government-only to eliminate duplicative or conflicting comments; standard A/E attending; back check to go over refuted comments

### Interview Summary: Mr. Perry Potter, 2 Aug 94

Process Map / Questionnaire

Review of overview flow chart

#### Strategic Decision

- Preplanning stage critical - AF doesn't put enough effort - very important
- Each approval process different - D/B/B, D/B, T/K - some decisions need to be made early - Is A/E cost over \$300K for 2807 notification requirements?
- For MILCON projects over \$5M, Air Staff automatically notifies Congress
  - Housing program - not done because method of delivery not known
- Design cost not 6% - programmed at 2.8% because it is repetitious
  - TurnKey design cost 1% if done in-house, which is the way AFCEE has handled all TK projects (4?)
- Critical need date - critical phasing must be decided here
  - Can't wait until execution phase to worry about notifying Congress, etc.
  - Make decision right the first time or it will be repeated

#### Preparation of RAMP

- RAMPs, PD not performed in housing projects
  - PM will start project with 1391 and a letter from the MAJCOM
  - Initial site visit - orient MAJCOM & base to what AFCEE is doing, go over project requirements, create a PMP, validate strategic decisions
    - Is TK really appropriate for the area? Keesler - no - talked with NAVFAC climate at Barksdale
    - What data available, what environmental analysis performed
    - Does base have geotechnical surveys already made?
    - Do they want Title II optional services in A/E contract? Handle @ base?
- On D/B or TK, cost of design is never programmed into the 1391 (because the base/MAJCOM didn't program it that way) - must normally add 2-3% to construction money.
  - Normal MILCON -- 1178 is submitted, allows for cost adjustments to PA to account for this, but normally, limited to adjustments within the command TOA
  - Housing starts 6 months later than normal MILCON, need to be RTA 6 months earlier than normal MILCON, ability to adjust is limited
    - so money comes out of construction \$
- CBD critical options and services - scope changes may affect ability to award, if range as advertised is exceeded

### Project Definition and RFP preparation

- PD - charrette developed to support D/B projects, now folded into PD for all MILCON
  - PD submittal requirements defined in CTL 90-1 or 90-2
- Charrette performed in housing, but PD-type submittal not required
  - Charrette documents - arch drawings, cost estimate, general concepts
- Preparation of RFP same
- Some people will push design above 30%
  - Problem is drawings start looking like construction drawings, so contractor may single out some details as not needed based upon what is received
    - "over here this level of detail, so I assumed that not wanted over here"
  - Air Staff (some people) wants use of Housing Community Plan as RFP document
    - Single line diagram, no dimensions, elevation, site plan (5% maybe)
  - Typical to D/B to have construction dimensions on floor plan
    - 1-2 additional submittals after charrette, then RFP is complete
  - 15% = PD complete IAW CTL 90-1
  - Life cycle cost analysis, 80% of decisions in first 20%
  - CMH wants to move more towards 15%, user generally not happy with vagueness
    - Fixtures, how many receptacles, etc. push the design farther, want dimensions
    - Need to describe everything important to user - can do in narrative format (specification item)
- Are alternates/substitutes allowed in MILCON or VECP only used?
- TK contracts - contractor proposes everything, from start to finish - give him guidelines like proposed layout and floor plans (from HCP), but not required to follow this (only acceptable standards - can make deviations as long as comply with basic criteria)
  - AFM 88-25 is a maze, TK buy-in is high dollar, so small contractors can't get a foot in the door
  - Trying to get more competition with this method - have been missing it in TK
- RFPs have a lot of attachments - topographic maps, geotechnical reports, copies of 88-25, other documents

- Stipends not used yet, but Mr. Potter not eliminating possibility - need an easy fund source - would like to look into use in future
- How to decide TK vs. D/B
  - User-dictated during first year
  - Must evaluate market - Atlanta multi-family market up 300% now, so bids are high, and bidders don't want to bother with up-front risk
  - Is project big enough to attract national contractors? Only locals? Contact COE/NAVFAC to get an indication of bidding climate, becoming member of National Homeowners Association for access to cost analysis and local trends
- Failures: \$20M FE Warren, 200 units, 1 bidder, 130% over
  - \$16M Barksdale, 200 units, 230% over -- too much construction in Dallas, local constructors don't want risk
- D/B does not require a technical solution - propose on quantity take-offs, cost estimate, management plan
- Travis project is TK
- D/B where AFCEE is the agent: A/E prepares RFP and required to do Title II services

Advertisement:

- D/B on about the same schedule as IFB - 30-45 days on street
- Management reviews are simpler than TK, but still follows 70-30 SS requirements

Specific questions:

What projects are appropriate for D/B?

- Point paper to Dr. Wolff - message in draft form approved at staff level
- Corps is delegating down approval lower than HQUSACE
- Market influences are very dynamic

Why should a project be chosen for D/B delivery?

- TK is RTA faster than any method, D/B quicker RTA than D/B/B
  - overall, not faster because of SS, 70-30 requirements
    - fastest is 5.5 months, can be ten months or more
  - D/B/B is typical 90 days - CBD = 30, 30 days advertise, 30 days award???
  - Used to not start D/B until 1 Jan, so construction funds are available when needed.
  - Early advertising authority if PDC shows 95% designed, if CWE is within PA, if you have good marks in the House and Senate
  - Housing - show project is 100% designed, will get authority to advertise as early as 1 Jun
    - Therefore, goal is to get every project RTA by 1 Jun, no matter if D-B-B, D/B, TK

--- In IFB project, no incentive to advertise that early, because money will not be available until Dec or Jan

--- D/B or TK process takes ~ 6 months, so start 1 Jun and will have money when needed

-- Army contracting much faster than AF, so SS process can be completed earlier

- Saving of design \$ -- much more in-house effort being expended for review

-- What you save in design, you spend in construction

- Construction time growth

-- Contractor sets his own schedule, incentive to finish earlier -- Mr. Potter says that similar conventional projects do take a little longer; D/B able to start construction earlier

Is it possible to satisfy the Small Business and/or Small Disadvantaged Business goals?

- Disaster - 2 housing projects D/B DBB both failures - rejected and readvertised unrestricted

-- Small contractors do not have experience managing professional teams - A/E firms, large labor forces, material issues on large scale

-- Complexity is in the magnitude of multiple repetitious units - each error is multiplied many times

TK package at Kirtland - just went out -- see Peer Gerlach



**Questionnaire: Mr. Campbell, Mr. Tschoepe, Mr. Leehy, Mr. Walton**

Capt. Andy Thorburn, AFIT Student

"A Design-Build Process Map"

11 Aug 94

Interview Questions: Mr. Darrell Campbell, Mr. Elbert Tschoepe, Mr. Larry Leehy,  
Mr. Cleo Walton

Summary of Research: I am working on my Masters Thesis to develop a process map for the AFCEE method of Design-Build Construction. This should form a foundation for future development of a D/B Project Manager's training guide. My research consists primarily of conducting interviews with experienced project managers.

1. In your experience, what projects are appropriate for D/B?  
What characteristics are necessary for a successful D/B project?
2. Early in the D/B decision process, the PM must identify whether or not the owner/user will be flexible in accepting a performance-based design solution. Is this generally a big concern?
3. Some projects are experiencing problems with the quantity of responses to the RFP. Can the market's ability/willingness to participate in D/B be adequately predicted during preparation of the PMP -- 2 years prior to RFP issuance?  
What have been your experiences with the quantity and quality of proposers?
4. I have listed some reasons why D/B is beneficial. Which are predominant on AF projects?
  - Demand for faster project completion
  - Better quality and continuous improvement in project delivery & final product
    - Ability to select the best qualified contractor
  - More innovative and cost effective
  - Desire to avoid legal entanglements of adversarial relationships
  - Better handling of risk
  - Saving of design dollars at the beginning of the project
  - Minimize cost and construction time growth
5. Do standard MILCON appropriation rules apply to AF Reserve; Environmental/IRP; Base Closure; etc. projects?  
Is there opportunity with some of these fund sources to combine design and construction authority sooner?

6. Is partnering being used successfully on D/B projects?  
Is additional funding asked for in the DD 1391 to cover the costs?  
Is it initiated only after award of the D/B contract, or is it used in PD also?
7. What is your opinion of the administrative workload of D/B as compared to D-B-B?
8. Has AFCEE used the Corps of Engineers' in-house personnel for Project Definition and RFP preparation?  
Are there lessons to be learned?
9. What are some of the differences in a PD "charrette" package for D/B, versus D-B-B?  
CID included, development compressed into 30-45 days  
All special equipment requirements and layout  
Power and mechanical requirements defined
10. After PD "charrette" is complete, can the remainder of the RFP development be handled by the PM and the Corps?  
Are performance specs normally developed during PD?
11. Are PD and RFP preparation costs considered Type A and therefore excluded from the 6% statutory limitation on Type B services?
12. Has AFCEE had any experience with two-step source selection procedures for D/B projects, where the proposers are screened for conformance to the RFP, then asked for bids on the project?
13. How do you feel about using a D/B method similar to the Navy's Newport system -- awarding the contract using a lump sum competitive bid?
  - Could possibly use this method when project is straight-forward and user's needs can be well defined in the IFB.
  - In your experience, has the lowest-priced proposal frequently been the one selected?
14. D/B presents an opportunity to build in life-cycle costs such as maintenance contracts into the proposal price. Has this been used on an entire facility or individual systems (roof, HVAC, etc.)?

15. Have there been specific problems in converting AF regulations into performance specifications (Tempest, security, communications, etc.)?

Are there projects where performance specifications failed to produce the desired result?

16. Has AFCEE ever issued and evaluated the RFP in advance of construction authorization?

Is this procedure too risky for the proposer (i.e., potential for cancellation)?

17. With 1-step procurement, there are two very difficult decisions to make: the determination of the competitive range; and determining a defensible "best overall value" by combining quality and cost.

What are your experiences -- do you have suggestions for improvement?

18. Have there been any experiences with D/B usage on renovation projects?

19. Has Turn-Key delivery been considered for non-housing projects?

20. Is it possible to satisfy the Small Business/Small Disadvantaged Business goals with D/B projects?

- Are there success stories with SB/SDB?

- Failures?

- Does AFCEE or local contracting office have a goal for D/B set asides?

21. Has AFCEE ever considered using a stipend to reimburse the short-listed firms and enhance the quality of their proposals?

22. Are Army Source Selection procedures less restrictive than those governed by AFR 70-30? Do you have examples of delays or suggestions for improvement?

23. When AF or AFCEE is the agent, who performs contract management and inspections at the site?

Does the base handle this?

24. When de-briefing the unsuccessful proposers, should they be allowed to view the winning proposal? (excluding management, qualifications, scheduling, use of resources, and financial background)

How do you accomplish this without "technical leveling"?

**Interview Summary: Mr. Darrell Campbell, 11 Aug 94**

**1) What projects appropriate?**

- Renovation projects generally not, but Bolling Family Housing was a success
  - From Mr. Leehy:
    - Changed floor plan (added square footage)
    - Electrical & mechanical modifications (new mechanical system)
    - plans & elevations on sketches, but no design
    - housing good candidate as long as # of plans limited, and not too many "row changes"
    - Were able to coordinate the mechanical and electrical plan before RFP issued, made sure it would work
- Housing in general, we put too much effort in plans & specs compared to industry
  - Industry using very simple plans & specs, like the AF RFP package
    - HUD form is a 4-page specification
    - Floor plan, site plan, kitchen & bath elevations, mechanical plan, electrical plan
    - Government trying to protect themselves
  - Housing is a good candidate for renovation because of this
- Typically say medical projects too complicated, but Navy has produced a RFP for clinics because most clinics are obtained in the private sector through D/B process
  - Similar to Newport process, but not sure
  - Not sure if successful, got caught up in the MILCON pause a few years ago
  - Could probably call Vince Spaulding for more information
- Mind set is that D/B projects should be a new facility, fairly straight-forward, something that the private sector is already doing a lot of
- Whiteman projects: Composite Maintenance Hangar was fairly complex, with a lot of organizations in building
  - Was originally traditional, at concept design stage, had to decide what was needed to convert to RFP in a meeting -- went through discipline by discipline, compared to hangars built at Holloman, pulled drawings from other D/B jobs to find minimum level of effort required
    - Had site plans, elevations, plans, felt that this was not enough
    - Utilities were sized, but contractor had to calculate to verify
    - No structural design, but some projects had the foundation designed (much debate as to whether or not this necessary)

- Holloman jobs, the foundation not designed -- just provided soils report and survey
- Navy model: three basic drawings -- site plan at 100% (all utilities sized), approved floor plan, building elevations
  - For child care centers, they design all cabinet work and storage areas
- D/B is really a form of turn-key
  - AF definition of TK is that the RFP doesn't provide drawings and any level of design, only performance specs -- evaluating designs

2) Is owner concerned about delivery method?

- Owner/user concern
  - BCE is responsible for all real estate, because delegated from the installation CC
  - Project Management Team has all of the key members
  - PMP: strategic decision plan - user activity, BCE, A/E, agent (DM, CO, etc. -- referred to PD diagram)
  - No opposition from AF customer, more opposition from Corps of Engineers because of not being the standard process
    - BCE welcomed it at Whiteman because it stops changes after PD
    - easier because user changes eliminated
    - personnel changes from reorganizing, moving, hard to resist
    - Had to change Whiteman job because of AF reorganization, objective squadron
    - Command resisted it (first one)
    - Agent's contracting people are most affected because have to set up source selection teams, they may be tied up for a long period of time
    - labor-intensive compared to traditional
    - AF process different from Army primarily from colors
      - each element translated for SSA, no scores used
      - has manual for looking up references from George Wash document

3) Predict market response at PMP stage? Experiences with quantity/quality of proposers?

can you attract any responses at 600K? Mostly large contractors are proposing, typically 3-6

- big failures in the TK area, as opposed to d/b
- whole objective of doing d/b is to do a PD level of design -- what the customer is really concerned about -- what it looks like, what the floor plan is

-- also take care of contractor, because investment in bidding is lower than TK

--- management plan more complicated than A/E's 254/255 requirements because of financial plan

- one reason to do TK is to enable site adaptation of a previous design (house), but this probably is not being done

5) Standard MILCON rules apply? Opportunity to combine d & c earlier?

- All Reserve projects have not had funding constraints, so D/B had an advantage

- AFCEE building, when strategic decision was made in Feb '92, decided against D/B because they would get RFP prepared a year prior to receiving design money ?? construction money??

- Minimum 10 month wait between RFP completion and advertising authority, sometimes up to 2 years because of MILCON cycle

- BRAC goes very fast -- March 16 OSD recommendation, BRAC commission 1 Jun, president

- Congressional inserts are good candidates also

-- in the past, only changes come from BRAC commission

-- by end of August, project list is out

-- now have 1/2 of normal MILCON cycle to complete project because of critical need date

-- one pot of money

-- No restraints at Homestead because was a '92 appropriation that was inserted (late) after the hurricane

--- \$76 million to design and construct

--- saving \$4 M on design by going D/B

- AF has tried to get congress to change the system

- In the future, more money will be in BRAC than standard MILCON

- Navy is using D/B extensively for BRAC -- SouthDiv got 14 open-end IDR (indefinite requirements- got it through because of reduced staff and huge requirements) A/E contracts for RFP preparation in advance of round 3

-- tremendous advantage to package contracts together under one A/E instead of separating -- reduced administrative workload, don't have to continually define parameters for separate A/E firms and work connecting design issues

--- enables them to place contracts without advertising in CBD

--- specialists for aircraft beddown, medical, dormitory, dining hall

6) Partnering being used/additional funding in 1391/PD phase also?

- Louisville the partnering leader -- have implemented 50 related to design, doing partnering on all construction projects
  - using in design at Homestead, used in construction only at Whiteman
  - costs have not been that high
    - Omaha originally saying cost was \$100K, were going to reimburse A/E for travel, etc.
    - L Leehy might have better idea
  - Louisville approach is that the partnering betters the firm, so to firm's advantage and profitable to participate
- no special funds requested from AF
- typically 10-25 K for whole project
- charrette process accomplishes much of partnering goals
  - spend a week with team and all users, developing design
- process could be improved if partnering session before charrette, like at McClellan
  - \$30 M project industrial and personnel support separate A/E
  - environmental separate from BCE, can stop project
  - A/E firms did data gathering for a month, then everyone met back together, by that time everyone knew each other real well
    - project stopped at PD, but products were very good

#### 7) Administrative workload

- more contracting-intensive
  - takes much more planning because it is new and unique
  - trying to get this mind set on all projects
- package with other projects

#### 8) Use COE for PD/RFP?

- succumb to agent pressures to use in-house people
  - Beale job (Sacramento) because Army lost most of jobs in CA, needed the work
    - traditional project, Corps took from PD to 100% complete
- Luke job Corps took project through PD
  - Col. Scott wanted to give training in PD
- Homestead, COE doing in-house design
  - creating additional work for AFCEE because need to train and COE doesn't have a single leader to give directions on project / manage work force
  - can't design fast
  - trying to put together a team that would also do the A/E reviews when they started coming in; become familiar with the base

- projects not time critical, can work on while not reviewing A/E stuff, keep team concentrated on Homestead projects to eliminate multiple recommendations from reviewing engineers
- concept worked well with AFSOC at Hurlburt

9) Differences in PD package for D/B?

- Special equip requirements and layout no matter what, need realistic estimate of cost
- Used to do schematic floor plan
  - now doing major building systems
  - becomes much more crucial, higher level of detail
- SID done for PD typical
  - interior colors & finishes for D/B; color schedule
  - user doesn't want to take a chance
  - normal PD, still need materials for estimate, just not color coordination
  - furniture & equip for key spaces vs. for all (d/b)
    - no time to do coordination later
  - PD has footprint of desk, CID picks the ordering information for desk, color, etc. hardware
    - could do generic footprint in D/B and allow contractor to pick
- Whiteman specified finish but not color (SID)
- bottom line is it varies with the project
  - does compress the schedule from ~ 3 months to 1 month for full CID
  - level of risk is higher, so is a tendency to do more design in D/B
  - need to question everything -- is this level of detail really needed or can a performance specification be used?
  - structural example: make sure the section works, but don't worry about designing the details
- since 1990, been telling people to do building systems narratives
  - define exterior building system
    - how is exterior wall going to be built - finishes, brick, double-wythe, interior walls masonry, gyp board
    - roof system slope, where does insulation go
- select 3 mechanical systems to run the energy analysis on instead of letting the designer choose them
  - eliminates the "I can't maintain that system" response

10) Can PM and/or COE complete RFP after PD finished?

- adding specs to the PD



- developing from the building systems narrative
  - ex: roof system is structural standing seam, copper patina, bar joists, color approved by user
- RFP performance specification development will show where insulation is, section on insulation, section on bar joist

#### 11) Type A or B for PD/RFP?

- many agents want to consider PD as programming effort, special study
- did a matrix comparing 35% design/PD/agent 35%
- basically, the same products are provided, process has changed
  - old process for redesign had higher cost - not on-site
  - not doing programming with design money, just validating RAMP requirements
- one problem is that the charrette process has been called architectural programming when initiated by CRS Inc. in 1940s
  - clear distinction between establishing requirements before starting design
  - otherwise, clients react to drawings and design gets very intense
- AFCEE warning A/E not to start design too early, until requirements validated
- for large project, need an analysis charrette and keep things in alphanumeric stage
  - generate discussion without drawings & validate scope
- RAMP should not attempt a floor plan, won't have enough information to be useful
  - narrative requirements, who they are, kind of space needed, future plan (BCP), area plan, additions proposed, arch standards, environmental issues
- geotechnical services or other Type A - similar needs would still fall under A, but rest of PD is type B
- Typical PD costs 1.5 - 2% (Pat and Darrell.)
- whole idea for starting design early is to meet the congressional approval window (BES)
  - validating 1391 until 15 Jan gate - President's budget (referred to PD diagram)
  - often, OMB will drop projects if not to PD stage, since no level of design to validate 1391 costs

#### 12) Experience with 2-step?

- 2-step all proposers generally comply with the RFP
- advantage of 1 step is it lets you evaluate price and quality

- emulating private sector, talking to past customers
- award to higher price proposer, says has happened on most of AF projects
- not maximizing advantages using 2 step

13) Newport system/award to low bidder frequently?

- Less detail in RFP, might require intensive management of A/E
- less time with customer
- less intensive SS process
- agrees that Newport system is probably good, not that only using on simple projects
- thinks that 50/50 low price taken

14) Life cycle costs ever built into proposals? Individual systems or entire facility?

- Trane trace run uses life cycle costs for evaluating mechanical systems
- add life cycle costs as an evaluation factor
  - energy drives project, accept most cost-effective system
- consider life cycle disposal costs, carpet or other environmental factors
  - buy light at a price per SF, specified in foot-candles, contractor can provide as skylight if he wants

15) Problems converting AF regulations to performance specs? Projects where performance specs failed?

- problem areas - take that element to 100% design
  - done for SCIF at AFCC HQ / Scott AFB
  - D/B provides flexibility to take only certain elements as far as needed
- everyone is trying to define and learn the process
  - products are not the same
  - need more of PAT efforts for D/B

16) Advanced authority used/ too risky?

- Advanced authority in July, usually
- In order to make D/B work as intended, need authority a year early (at PD stage)

17) Determination of competitive range/best overall value

- Hard to defend if quality ratings very close
- Evaluation factors give you the defense
- Are the differences great enough to single them out
- His experience, quality level varies a lot, so not so hard
  - no budget problem on a couple, so not a hard cost choice either
- Contracting most comfortable with lowest price, most defensible

- But why spend all of the effort if you are reaching the same point?
- Can issue amendments, have discussions

19) TK used on non-housing projects?

- Avoid TK if some level of design can be accomplished
- PD process can be accomplished in 6-12 weeks, so time extension minimum
  - reduces a lot of risk for the customer
  - contractors should be more comfortable pricing D/B
- TK turns into a beauty contest
  - Proposal that has the glitz & best design will get most attention
    - other details will be lost - quality of structural, mechanical, personnel
  - Commissaries possibly using TK, and glitz is winning
    - MILCON rules not followed, not MILCON money
    - most of budget is from surcharge
    - issue mechanical systems standards (refrigeration boxes, etc.) in form of many drawings, so probably not true TK

20) Small Business Administration

- SB/SDB usage used in evaluation factors for Whiteman job (subcontracting plan)
- over \$500K, must present a plan how utilizing, no percentages
- in D/B RFP, can reward them for greater usage
- D/B set asides - use when it makes sense, no goals

21) Stipend to reimburse short-listed firms?

- reimbursing would have advantages, but not a whole lot of money left
- back in '89, AF ran out of design money and couldn't get any more
  - projects stopped
- AF designing whole MILCON program at 9% and is making it
  - not a whole lot of individual slack within the commands
  - reduction of overall design expenses, so resistance to spending more
  - push to D/B because of shortage of design funds
  - 2-3% per project instead of 9%

23) Who performs contract management and inspections at site?

- using Title II contract for A/E services
- can call up specialists if needed
- base can handle it, but usually doesn't
  - Barksdale - handling d & c as agent

- 24) Should unsuccessful proposers be allowed to view winning proposal?
- don't ask for information and share information you don't have to
  - don't give information that will support a protest
  - looking for anything that is said or done

**Interview Summary: Mr. Elbert Tschoepe, 11 Aug 94**

- 1) What types of projects appropriate?
  - types of projects -- not too technical
  - RFP can specify exactly what is required
  - undefined requirements not good
  - paving, piping systems, storm sewer jobs not good since job is just about designed when RFP is done
    - however, performance-type RFP could work without 35% design documents
    - give us a 8" pipeline
  - doing waste water treatment plant D/B, got one that just started design
    - forced to D/B because of design fees limitation
  
- 4) Why D/B is beneficial?
  - faster project completion - only because construction during design; overall construction time not shorter because of D/B
  - better quality of materials - not necessarily
    - AFCC HQ boxes for telephone in floor were not specified exactly as desired; had to pay the contractor additional money to make up difference
    - Wall finishes - user did not tell exactly what was wanted, so more modifications needed
  - earlier D/B projects done because directed to try different strategy
  - lately, design funds driving: 2-3% up front, the rest moved to construction rather than paying 10-14% design costs
  - Kelly project selected the day before the pre-design conference because of money
  
- 5) Standard MILCON rules apply/opportunity to fund construction early?
  - all environmental projects standard MILCON - money is set aside
  - Gen. McPeak has special interest in WWTP, so money inserted
  
- 6) partnering
  - COE takes it out of S&A, so far only construction being partnered
  - may ask for replenishment later
  - if don't use all of design money, will ask for replenishment of contingencies
  
- 7) Administrative workload
  - administrative load from PM 3-4 times greater, because AFCEE doesn't normally do contract administration

- same argument from COE
  - use the same amount of man-hours, just shorter time period

9) Differences in a PD package for D/B?

- mechanical no more than for regular project
- PD is called 15%, but is more than old 35% designs - same data, but don't have complete specifications
- out briefing at RFP also

11) PD costs type B or A?

- PD costs subtracted out of total design, cost reimbursed in proposal
- depends upon contracting officer

12) 2-step experiences?

- Housing using two-step
- Project at Lowry for Finance Center - short suspense
  - used performance specification (TK)
  - no proposers
  - schedule slipped, used 35% design, had 8 proposals

13) Newport system/low price frequently selected?

- has talked to Navy, can't tell much difference between Newport and AF system
  - thinks that there is an RFP with a management review, just no technical review
- his experience is that AF frequently awards to low bidder of qualified firms
  - contracting officer influence
  - formula combining cost and quality, but not used
  - same project provided between two bidders, one is easier to deal with
    - COE wants to award to higher price, but command says no
- when list is sent forward to CO, not ranked - just who meets requirements
- some RFPs written such that low qualified bidder will win
  - varies, some use formula
  - cost always figured in, never just award to highest ranked proposal

Note: The remainder of the interview was taped over

**Interview Summary: Mr. Larry Leehy, 11 Aug 94**

1) What types of projects appropriate for D/B?; What characteristics necessary; Renovation experiences?

- Much repetitiveness, industry does a lot of - ideas from
- but can do just about anything
  - Cryptologic facility, HQ, dorms, avionics facilities, all very successful
  - doing projects where much definition is not available (unknowns) -- flight simulator equipment not set, so can define the area needed early and refine later in project as more criterion becomes available
    - Flight simulator has not been done, but was discussed
      - could work if simulator portion of building was an appendage, not a central part of building affecting everything else
- Medical projects not being done unless very simple - well defined
  - Must go so far in design to ensure appropriate quality, that D/B advantage is wasted
- Did outpatient clinic on VA property in Albuquerque
  - Did 35-50%; floor plan and elevations to a great deal of detail
- Total performance project won't work for AF because to many specific criteria
- Dorms work with D/B if leave flexibility in choosing floor, wall systems, modular construction
  - Problem is that the base typically wants to site-adapt one that worked
- Renovation
  - talked about D/B on a club
    - highly visible, would require too much definition in interiors
  - Bolling housing project, about 50% design
    - Floor plans & changes in narrative format
      - submit management & experience qualifications
    - option to give same result in any way proposer wanted
      - also submit plans for tech evaluation
    - no one chose to pursue that option
    - successful contractor didn't think completion of drawings really necessary - echoes Darrell's comments on too much housing design

3) Predict market responsiveness at PMP stage? Experiences with quantity and quality of proposers?

- Having problems on TK process

- Technical evaluation required, will have responses if project large enough
- Do a market survey
  - Barksdale project - 3/4 contractors not used to TK complexities and not used to working with designer, so not interested
  - Not possible to predict how busy the contractors are going to be
  - Would not try that size of housing project (\$8.6M) at Barksdale again
    - TK needs to be > \$10 M
    - Might try D/B at that funding level
- Seeing limited response now, 3-4 years ago seeing more (6-8)

#### 4) Factors why D/B is beneficial

- Faster project completion
  - WRM warehouse done from concept to complete in 9 months
    - SS was very short (lowest price technically acceptable)
    - similar to Newport
    - also used on housing projects up in AK successfully
    - really the only way to speed up the process (gain time)
    - lose some of the advantage of choosing the best quality proposer
- Best qualified contractor - big reason for selecting D/B
- Innovation in housing
  - TK contractor gets to decide how much he'll give you based upon price of project
    - Worked exceptionally well in recent housing projects
  - could work with Child Development Center, some Administrative
- Cost effective
  - market place and bidding climate always vary
  - cost growth and time growth always less than conventional
  - not possible to do true comparison
  - have talked about doing two dorms side-by-side, but this never happens
- Legal
  - no claims to date
- Risk
  - hard to quantify cost effectiveness

#### 6) Partnering not an AF standard

- Most of AFCEE experience on D/B, partnering not used because it wasn't vogue
- AFSPC directive to use partnering on all projects



- Individual choice
- Partnering a way of life, and pays for itself with the little added cost & time
- Have had some unsuccessful partnering arrangements (D-B-B)
- Strategic planning checklist has partnering decision

7) Administrative workload

- Early on, RFP workload considerable
  - especially SS process
  - now PD required on all MILCON, so workload is similar
- Newport similarities
  - very seldom do proposers get thrown out of competitive range
  - need to fight contracting mentality to award to lowest bidder
- Cost/quality information - not all released

8) Use of COE personnel for PD and RFP?

- Early on, AFCEE kept control of RFP and handed off to COE
- Now RFP has been defined, so COE can handle
- Pat Smith gave Mobile a "directive" on what he wanted, and they have followed it very closely
- Problem with quality and talent of COE team
- If AF causes a delay, team members go off to do other things and are difficult to get back on project
- More consistent quality with A/E PD

12) Experience with 2-step SS?

- No advantage - might as well take low bid

13) Newport system; Has low-priced proposal frequently been chosen?

- Probably large portion of projects are taking low bid, but no data has been gathered

15) Problems converting AF regulations to performance specs; any cases where performance specs failed to produce desired result?

- TK project - kitchen cabinets, appliances, roof system, flooring system
  - quality problems
  - 100% performance
  - now trying to define more - state level of quality expected for windows
- conversion has been successful
  - must be very knowledgeable, know what to pull out of specification

16) Advanced authority; too risky for proposers?

- now being allowed in housing, (1 Jun) but not tried yet
  - proposals will be evaluated before appropriation
  - first year that they will be this far along
- not too risky, typically projects authorized for advanced authority are good to go
  - doesn't know of any that have been canceled
- advanced authority being given because of 6-8 month SS process
  - timing works out to have project ready to award in Jan/Feb when money is there
  - otherwise, can barely award in the year of appropriation
- not presently in a situation to benefit from advanced authority on traditional MILCON D/B projects
  - None are that far along, but Larry thinks Air Staff would authorize
- Date varies, based on some of the appropriation committees would have met and discussed the project

19) TK been considered for non-housing projects?

- Child Care Centers - AFCEE has not done
  - Seattle district did 2 CDCs

20) SB/SDB goals/failures/appropriateness?

- No longer a Small Business program in the construction area
- Small Disadvantaged Business
- Don't think they would be successful, experience level not there
- SDB D/B at Mountain Home dorm renovation not successful
  - not as many proposers as anticipated
  - way over budget
- Basically don't think it would be appropriate for D/B, so no goals

21) Stipend to reimburse short-listed firms?

- Stipend might help on smaller projects
- MAJCOMs must come up with money, probably not interested in giving away money they don't have

22) Army SS procedures less restrictive?

- Use more discussion rather than scoring to make decisions
- Regulation requires evaluation system
  - Interpretation of evaluation method that discussions are appropriate
  - Simpler process
- Is it better?

- thinks AF system is fairer to contractors with tight, rigid system
- Would like to see time cut down
  - Some of restrictions in AFR 70-30 written for weapons systems
    - Soundness of approach
    - Performance risk assessment group separate from everyone
    - Simplify or eliminate for design and construction

24) General discussion D/B

- Results have been outstanding in most areas
- Timeliness of SS process is a real problem, would like to see it improved
  - If SS process improved, more projects would go that way
- To everyone's advantage to have designer and contractor together
- Length of SS and chance of protest need to be addressed
  - Incentive may work to avoid protests

**Interview Summary: Mr. Cleo Walton, 12 Aug 94**

**1) What types of project appropriate/characteristics/renovation experience?**

- Avionics repair facility at Tinker - very complicated
  - under floor duct systems
  - clean rooms, special requirements
  - A/E used to develop Project Book and up to 35% design
    - light fixtures, receptacle locations
    - gave him a detailed floor plan
  - COE not used until RFP preparation
- Tomography facility at Hill, x-ray minuteman missiles
  - \$2.5 M facility, with \$9M equipment buy
  - facility required 13' thick walls
  - only 2 manufacturers for the equipment; one was a silo raised up and down, the other stood the missile up and moved x-ray up and down
    - RFP had to give option of using either system
  - Had basic floor plan with offices and size of rooms
  - Electrical/Mechanical used a matrix, nothing shown on drawings
    - this office has 50 foot-candles, 3 receptacles, telephone outlets, switched, nothing on drawings other than quantity
  - maybe considered 15% design
- WRM Warehouse at Mountain Home, \$1.3M for air-transportable hospital
  - 4 Mar start, 15 May advertised, 18 Jun open bid, 21 Jun evaluate, 23 Jun ready to award, problems getting money, 22 Jul award, 2 Aug pre-design, 12 Aug 100% site-foundation drawings with 35% building drawings, 12 Sep 100% drawings complete, pre-final 9 Dec, move-in 15 Dec
  - Deadline was first week of Dec
  - First government job the contractor had done, had performed D/B before
  - Gave requirements, did not require presentation of design
  - Management plan, past experience
  - PD not done
  - COE didn't even stamp his drawings
  - Used commercial standards
  - 7 proposers, not awarded to low bidder
    - no time to issue BAFOs, contracting worked with evaluators
    - no de-briefings used because not asked for
  - Matrix for electrical/mechanical requirements, telephone/comm outlets
  - A/E suggested changes to down spouts and exterior lighting

- Tyndall Warehouse
  - 14 months to produce RFP with Mobile in-house
  - COE too restrictive on proposal requirements, Cleo changed
  - 5-6 proposers, 2 months to evaluate
- To take advantage of contractor's expertise, must describe what you are looking for and the quality of what you're expecting, let the contractor do what he is good at - putting them together
  - give as much leeway as you can in meeting requirements
- Clinic possible?
  - ambulatory care clinic with day surgery possible
- D/B will be successful with a good RFP - can use on renovation if requirements defined

3) Quantity/quality of proposers

- leave RFP open and take out a lot of the nuisance factors
  - minimize the effort required, more contractors will propose

6) No formal partnering agreements used in his experience

- that attitude is needed, it is a team effort, takes commitment

7) Administrative workload

- more intense - must get all requirements up front
  - Tinker project, people thought changes were possible later
  - same hours, compressed into tighter time frame

8) In-house work force

- COE Seattle district had to fight their own people to get Mountain Home project done
- would prefer to work with A/E for PD/RFP because of Corps mind set

9) Differences in PD package

- need to spend more time identifying what the true requirements are
- longer time period in conventional, more time to make decisions

10) PD development

- (project description) could be handled by the PM, user and COE - no A/E involvement
- need A/E and COE to put RFP together
- Difference between PD and RFP
  - PD (description) is written requirements
  - RFP has drawings, specification requirements, quality

-- some of the words put into drawing format

13) Low bidder

- His experience is that it is not generally true

15) Performance specification problems

- No problems
- Incorporated mil specs into RFP documents

20) SB/SDB doesn't matter

- If you get a good one
- SDB set-aside at Keesler awarded at \$4.1M when PA is \$3.8 (conventional)
- no D/B set asides for SDB

**Questionnaire: Mr. Peer Gerlach**

1. Why are the MAJCOMs allowed to be the agent for housing projects?
  - Why unlimited authority for D/B?
2. Does the housing PD stage start 6 months later than standard MILCON because there is not a RAMP requirement? (Fig 2-6, Blue Book)
3. How do you decide between a TK or D/B delivery?
4. Is proposal evaluation as a ratio of cost and quality still allowed? (Ref. AL 85-43, Nov '87, not allowed)
5. Some projects are experiencing problems with the quantity of responses to the RFP. Can the market's ability/willingness to participate in D/B be adequately predicted during preparation of the PMP -- 2 years prior to RFP issuance?
  - What have been your experiences with the quantity and quality of proposers?
6. I have listed some reasons why D/B is beneficial. Which are predominant on AF projects?
  - Demand for faster project completion
  - Better quality and continuous improvement in project delivery & final product
    - Ability to select the best qualified contractor
  - More innovative and cost effective
  - Desire to avoid legal entanglements of adversarial relationships
  - Better handling of risk
  - Saving of design dollars at the beginning of the project
  - Minimize cost and construction time growth
7. Is partnering being used successfully on D/B projects?
8. What is your opinion of the administrative workload of D/B as compared to D-B-B?
9. With 1-step procurement, there are two very difficult decisions to make: the determination of the competitive range; and determining a defensible "best overall value" by combining quality and cost.
  - What are your experiences -- do you have suggestions for improvement?

**Interview Summary: Mr. Peer Gerlach, 12 Aug 94**

**1) Why are MAJCOMs allowed to be the agent for housing?**

- Why Congress gave DOD D/B or TK authority
  - As DOD, we don't know as much about building houses on a massive scale as a developer does, so in order to utilize their expertise on building quality houses, site development, site engineering, landscaping, everything to do with building a total community; solicit a RFP
- AFCEE defines TK as a total design bid request by the proposer
  - Don't know what kind of floor plan the AF is going to get
  - RFP will probably specify one-story only or maybe duplexes, etc.
- D/B means submit package minus the plans and specs
  - A/E does a 35% design and an 80% completed specification, proposers will conform to it
  - SS process primarily based upon management plan, making process much tighter and quicker
  - locking them in on a plan, can't deviate
- Sometimes charrettes done in-house with the base, come up with some sketches to include in the RFP package
  - He has never had a charrette
  - Talk to Bob Shaw about differences between charrettes and 35% design
- All RFP packages are unique
  - DeCA doing D/B for Commissaries
    - give CONTRACTOR a complete set of documents (up to ~80%) and only had 4 plans
    - very restrictive
    - only using management plan, experience & price to judge SS
- AFCEE trying to allow as much flexibility as possible (TK)
  - give them a sketch in RFP, but if proposer has something better, they want to see it
- TK - no charrettes done, no A/E involvement
  - Documents provided: Residential Energy Evaluation Manual, Topographic Map, Geotechnical, 88-25 guidance (soon to be obsolete - incorporating into performance specification or statement of work)
  - Geotechnical includes soil analysis and background, soil bearing capacities for both spread and box footings, design assumptions for spread, box and slab on grade
  - Goal is to have generic statement of work, incorporate uniqueness in Appendices



- Money from Congress - MILCON cycle
  - Housing money treated differently, congress hangs onto money longer - not sitting there waiting for them in MAJCOM or AFCEE hands
  - Money in Air Staff hands at all times until asked for & needed
  - Can award at PA + 25%
  - Proposers know CCL
  - Design within 8% includes SIOH and contingencies
    - Or can use 11%, which is 6% SIOH and 5% contingencies, which is what the 1391 uses, or can use MAJCOM figures
  - 6% statutory limits don't apply
  - Can generally design at 2 - 2.8%, but this cost not included in 1391
    - must come out of construction money

- 2) Does PD stage start 6 months later for housing because RAMP not done?
  - Haven't been doing RAMPs in the past because were primarily doing unawardable or late projects
  - Will begin to use management plans in future
  - Advanced advertising authority for 1 Jun, will now be ready far in advance of money received
    - Money is not typically available on 1 Oct, plan for 5 Feb
      - delays for Congress to sign bill and budget people to distribute
- 3) How decide between TK or D/B?
  - Key decision on D/B vs. TK up to base
  - If they have a phased schedule, continuing the same floor plan, recommend D/B
    - Use plans & specs already developed or hire another A/E
  - D/B too restrictive if looking for whole new concept or betterment
    - McConnell replaced housing with TK for phase 1 after tornado
    - didn't like results, so for following phases using TK again
  - If firm has an off-the shelf design, allowed to propose a 5% bigger floor plan
    - See documents given to me
    - CCL remains the same, so site development, landscaping, playground, quality of materials will suffer
- 4) Proposal evaluation as a ratio of cost and quality still allowed?
  - Tech team not looking at costs
  - Proposers ranked, if over CCL, MAJCOM asked for more money

- 5) Ability to predict appropriateness at PMP stage?
  - Market changing, new housing declining the last few months
  - getting good responses on recent RFPs (75 asking - most are suppliers)
    - hope for 4-6 proposals
- 6) Reasons why D/B is beneficial
  - Project needs to be at least \$20 million for TK
  - thinks that \$5M is good lower limit for D/B
  - Thinks the whole SS process can take 4-5 months from authority to advertise to award
- 7) Partnering evaluated as part of SS - management plan
- 8) Administrative workload
  - Estimates are not as severe unless you hire an A/E
  - D/B quicker than conventional
  - TK work hours less
  - SS still needed for D-B-B
- 9) Determination of competitive range and best overall value
  - Sometimes when evaluating, the best proposer may have exceeded the CCL
  - To enable a level playing field, can raise the CCL and issue notice to all proposers
    - Discussions CR/DR ask for BAFO
  - Using debriefings
  - Protest can be put in force with a 29 cent stamp

## BIBLIOGRAPHY

ASCE (1992). *Design-Build In the Federal Sector*, Report of the Task Committee on Design-Build, American Society of Civil Engineers, April.

Bradford, H. (1991). "Design-Build Issue Heats Up." *ENR*, 227(3), 7.

Branca, A.J. (1987). Cost Effective Design/Build Construction. Kingston, MA: R.S. Means Co.

Charles, M. (1994). "ASCE Blocks Move to Weaken QBS Law." *Civil Engineering*, 64(9), 124.

Cosgrove, T. (1991). "Design-Build Checks Out at Library." *ENR*, 227(11), 32.

Denning, J. (1992). "Design-Build Goes Public." *Civil Engineering*, 62(7), 76-79.

Dreger, G.T. (1994). "Design-Build Procurement: A Framework for Integrated Management Information Systems." *Cost, Time, & Risk: Evaluating Project Delivery in the Face of Change I*, Conference Proceedings, The American Institute of Architects, Austin, TX, March 25-26.

Edwards, V.J. (1993). Best Value Source Selection Proposal Evaluation Handbook. Washington, DC: The George Washington University National Law Center Government Contracts Program.

Engineering-Science (1991). *Analysis of United States Air Force Design-Build Procurement*, June.

FCC (1993). *Experiences of Federal Agencies With the Design-Build Approach to Construction*, Consulting Committee on Cost Engineering, Federal Construction Council, Technical Report No. 122.

"For Design/Build" (1994). "For Design/Build, It's All in the Perception." *Civil Engineering*, 64(6), 11-12.

Hogg, A. (1994). "Design Build Growth Changing PEs' Role." *Engineering Times*, 16(4).

Hoyt, C.K. (1993). "Package Deal." *Architectural Record*, 181(11), 36-37.

Kreikemeier, K.G. (1994). "Streamlining the Project Delivery Process - Knowing How to 'Win With Design-Build'." *Cost, Time, & Risk: Evaluating Project Delivery in the Face of Change I*, Conference Proceedings, The American Institute of Architects, Austin, TX, March 25-26.

Leehy, Larry (1994). Personal interview. August 11.

McManamy, R. (1994). "Design-Build Goes Back to the Future." *ENR*, 232(23), 26-28.

Moore, W.B. and Neve, T.L. (1989). "Contracting for Quality Facilities." *Excellence in the Constructed Project -- Proceedings of Construction Congress I, San Francisco, CA, March 5-8*. ASCE, New York, NY, 369-374.

MOU (1989). *Memorandum of Understanding (Level 1) Between HQ USAF Directorate of Engineering and Services and HQ USACE Director of Military Programs*.

Merwin, D.P. (1990). "Design/Build Public Projects: Has Their Time Come?" *Highway and Heavy Construction*, October, 20-21.

Mortitz, William (1994). Personal interview. 1 August.

Oswald, T.H. and Burati, J.L. Jr. (1992). *Guidelines for Implementing Total Quality Management in the Engineering and Construction Industry*, The Construction Industry Institute, Source Document 74, June.

Post, N.M. (1994). "Making a Federal Case for Design-Build at Two-Tower Project." *ENR*, 232(11), 34-38.

Potter, K.J. and Sanvido, V. (1994). "Design/Build Prequalification System." *Journal of Management in Engineering*, 10(2), 48-56.

Potter, Perry (1994a). *Background Paper on Design Build Delivery Strategy*.

Potter, Perry (1994b). Personal interview. 2 August.

"Procurement" (1994). "Procurement Reform Bill Includes 'Shortlisting' Option." *Design-Build Dateline*, 1(3), 1-2.

Schoumacher, B.H. (1990). "Design/Build Contracts." *Consulting/Specifying Engineer*, Mid-March, 27-28.

Setzer, S. (1991). "One-Stop Shopping Has Designers Nervous." *ENR*, 227(6), 9-10.

Smith, Patrick (1994). Personal and telephone interviews. June-October.

Songer, A.D., Ibbs, C.W., Garrett, J.H., Napier, T.R., and Stumpf, A.L. (1992). "Knowledge-Based Advisory System for Public-Sector Design-Build." *Journal of Computing in Civil Engineering*, 6(4), 456-471.

Spaulding, V.M. (1988). *A Study on Integrating the Newport Design/Build Strategy into the NAVFACENGCOM Facilities Design and Acquisition Process*, Naval Facilities Engineering Command, May.

Tarricone, P. (1993). "What Do You Mean by That?" *Civil Engineering*, 63(4), 60-62.

Thomsen, C. (1994). "Project Delivery Strategy." *Cost, Time, & Risk: Evaluating Project Delivery in the Face of Change I*, Conference Proceedings, The American Institute of Architects, Austin, TX, March 25-26.

USACE (1993a). *Request for Proposal Process*, Process Action Team Report, US Army Corps of Engineers, Louisville District, April.

USACE (1993b). *Architectural and Engineering Instructions, Design/Build for Military Construction*, Draft Copy, Headquarters US Army Corps of Engineers, January 7.

USACERL (1990). *One-Step and Two-Step Facility Acquisition for Military Construction: Project Selection and Implementation Procedures*, US Army Construction Engineering Research Laboratory Tech Report P-90/23, August.

USAF (1990). *Construction Technical Letter 90-1: Management of the MILCON Planning and Execution Process*, Headquarters US Air Force, 6 March.

USAF (1991). *Project Manager's Guide for Design and Construction*, US Air Force, Office of The Civil Engineer, September (Revision).

USAF (1993). *The US Air Force Project Manager's Guide to Project Definition*, Incomplete Working Draft, Version 6.0, US Air Force, December.

USAF (1994). *Memorandum of Understanding Between HQ AETC, HQ AFMC, HQ AMC, HQ AFSPE, HQ ACC/CE's, HQ AFCEE/CM (Field Operating Agency) and U.S. Army Corps of Engineers (USACE) Major Subordinate Commands (MSC's) for MILCON Execution*, Department of the Air Force, Headquarters Air Combat Command, 11 July.

Wolff, R.D. (1994). *Guidelines for Use of Request for Proposal (RFP) Method of Acquiring Design and Construction Services*, Draft, 5 October.

## **VITA**

Andrew Allan Thorburn was born in Mountain View, California on October 31, 1966, the son of Matthew Andrew Thorburn and Susan Dorothy Thorburn. He attended Homestead High School in Cupertino, California until 1982, then transferred to Ridgefield High School in Ridgefield, Washington. Upon graduation from RHS in 1984, he entered The University of Washington in Seattle, Washington, beginning the Air Force Reserve Officer Training Corps program. During the summers of 1985 and 1987, he took courses at Portland State University in Portland, Oregon. He received the degree of Bachelor of Science in Civil Engineering from The University of Washington and a commission as a Second Lieutenant in the US Air Force in June, 1988. He was employed as a construction inspector for King County, Washington until November, 1988. In February, 1989, he entered active duty service in the US Air Force with the 1002d Civil Engineering Squadron at Falcon Air Force Base, Colorado. He worked initially as a design engineer and then as a contract programmer. In July, 1992, he transferred to the 554th RED HORSE Civil Engineering Squadron at Osan Air Base, Korea to work as a project engineer. He was promoted to Captain in October, 1992. In August, 1993, he entered The Graduate School at The University of Texas.

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